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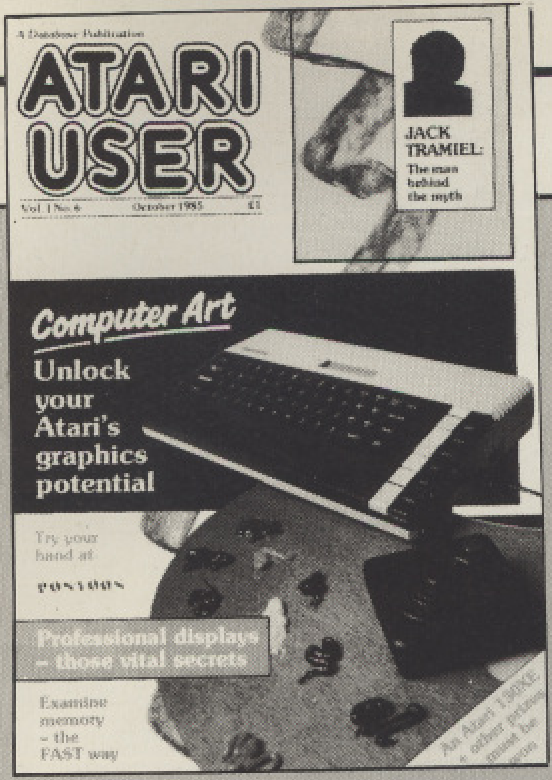
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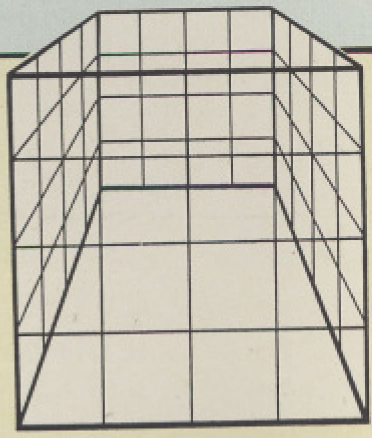
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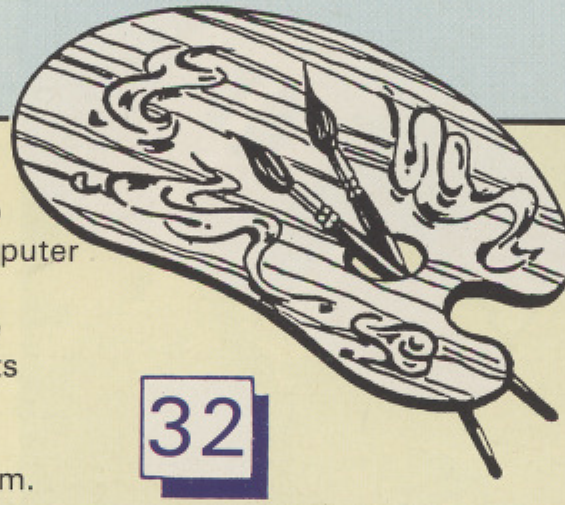
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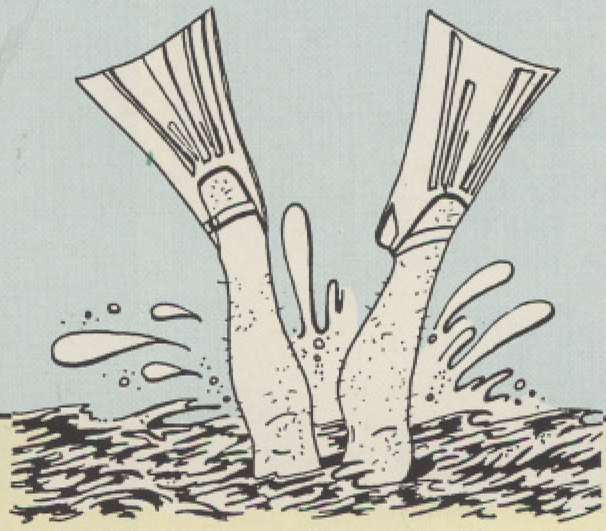
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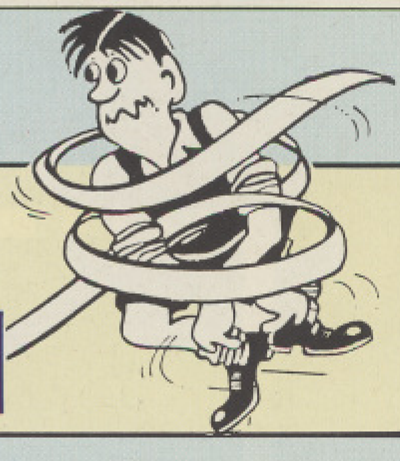


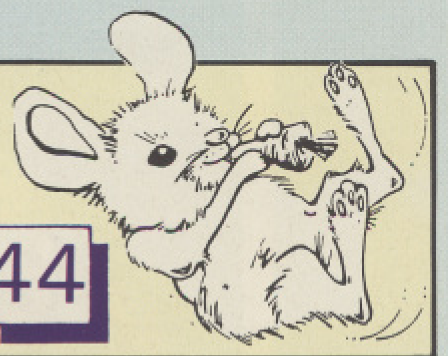


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Two budget packages launched

ATARI UK has launched new budget packages for both the 800XL and the 130XE which effectively slash the prices of both machines in the run up to Christmas.

The 800XL – voted "Home Micro of the Year" in the British Microcomputing Awards 1985 – has been bundled with a joystick and game cartridge at £70.

This combintion would previously have cost in excess of £100.

Even bigger savings can be realised with an offer which links the 800XL with a data recorder, joystick and software pack.

Although the usual price would have been in the region of £150, this is now being offered at £99.

"You can't find better value for money anywhere", insisted a leading dealer. "It will be a runaway winner at Christmas.

"However it all points to Atari wanting to get rid of all their back stock of 800XLs, cease production and then concentrate on the 130XE".

A company spokesman was quick to deny this suggestion. "We just want it to be the most competitive in the marketplace this Christmas", he said.

On the 130XE front, there are also two new low-cost packages.

The first involves the machine, the 1050 disc drive and four pieces of software for £231, involving a saving of around £70.

But the star package of all sees the 130XE, 1027 letter quality printer and word processing software, together with three other pieces of software for £305.

In all the saving here would be in the region of £250.

"It is our intention to make this product the top-selling 128k computer this Christmas", says Rob Harding, Atari UK's sales and marketing manager.

Atari's aiming to clean up at Christmas

ATARI is already dreaming of a bonanza Christmas with the ST range twinkling brightly atop the corporate tree.

The company is forecasting that it will sell up to 30,000 of its latest machines in the UK alone before the end of 1985.

And it is reporting "significantly increased demand" here in Britain for the 800XL and 130XE models.

"We thought the season would start late this year but we've been proved wrong", Max Bambridge, Atari UK's general manager told *Atari User*.

"According to our dealers, the run up to Christmas is well under way with some excellent results.

"It all adds up to an extremely bullish market for Atari".

Of the 50,000 ST machines shipped by Atari world-wide by early September the UK received less than 3,000 machines, and a large percentage of these went to software houses.

However the month saw the arrival of 5,000 STs in Britain and this month's delivery will be in the region of 10,000.

"Nor will they be on the shelves too long", said Max Bambridge, "for even though the ST is not a seasonal machine, it just happens to have arrived here at this particular time of year.

"As a result it will prove to be an even better Christmas than we otherwise would have expected".

Germany is currently the number one market for the ST range outside the United States, followed by the UK, France then the Benelux countries and Italy.

However the UK is expected soon to overtake Germany which is only ahead because of the earlier launch of the ST there.

To ensure this, Atari's UK sales force are currently vigorously targetting sectors of the market for the ST.

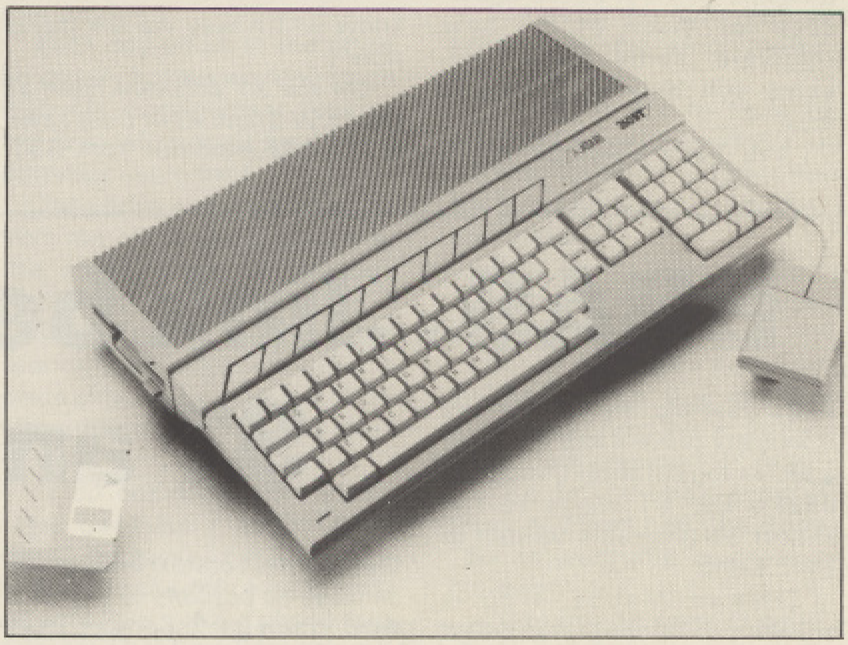
It is known they have considerable interest in the 1.2 million shopkeepers on Britain's high streets who have a weekly turnover of between £1,000 and £3,000.

"We now find ourselves in the position with the ST of being able to offer them something really worthwhile they have never been able to afford before", says Max Bambridge.

"The UK has always been known as a nation of small shopkeepers, but now we intend to make it a nation of small shopkeepers equipped with an ST computer.

"That's the best Christmas present they – and we – could possibly have".

Low key arrival for baby



ALMOST unnoticed in the excitement surrounding the consumer launch of the 520ST at the PCW Show, its baby brother – the 260ST – slipped quietly onto the scene.

The model was on display but behind glass doors, so preventing the possibility of hands-on testing.

And the only information available about the 260ST was that it has 256k of memory and a built-in half megabyte disc drive.

While revealing that the machine will be on sale in the UK shortly – mainly through high street chains – an Atari official was not prepared to put a price tag on it.

It was up to a leading dealer to indicate that he believed it would sell for less than £500.

Meanwhile the 520ST, mouse controller, half megabyte disc drive and black and white high resolution monitor will retail for £652, before VAT is added.

ST software comes flooding in

SOFTWARE houses both sides of the Atlantic have rallied round the Atari banner in the impending battle for market dominance by the new ST machines.

It is now estimated that by Christmas there will be more than 300 titles available for both the 520ST and its baby brother, the 260ST.

"Never before has a new machine had so much software available", claimed Rob Harding, sales and marketing manager for Atari UK.

"With this level of support we are confident the ST will become the leading 16 bit machine in the UK".

The ST range received a major shot in the arm when leading business software giant TDI revealed that some 150 of its titles are now available for the machines.

Yet another boost came with the news that the BOS operating language will now enable the ST to run more than 80 BOS business oriented packages.

At the same time, it is now known that 30 UK software houses are currently nearing completion of almost 100 additional titles for the ST.

The PCW Show in London provided the first public showcase for much of the new software, some completed, some still only in prototype form.

"We have been delighted with the response from the software houses", says Max Bambridge, Atari UK's general manager.

"It has been said that the ST would rise or fall depending on the amount of good software available for it. Well we certainly know which way we are going now".

> **UK software houses are currently number one in the world as far as production of programs for the ST range are concerned.**
>
> **At the consumer launch of the ST in London it was revealed that three times more British software than American is available for the machines.**
>
> **"It's very impressive", observed Jack Tramiel, chairman of the Atari Corporation, "but you do have the best software people in the world, thanks to being the most computer minded nation".**

On the ST software front at the PCW Show Atari User saw:

- A CP/M emulator from GST running a number of programs including dBase II, Microsoft Basic and Wordstar.
- Three spreadsheets, five databases and three word processors.
- The full range of Infocom adventure packages, including The Hitch-hikers Guide to the Galaxy.
- An Elite type package being developed for the ST from British Telecom's software house, Firebird.
- Lands of Havoc from Microdeal, which has the distinction of being the first software package to be converted for the ST here in the UK.
- The much praised small business package from Quest International, Cash Trader. This has been nominated for a major newspaper award.
- K-Spread from Kuma Computers, a blend of mouse and keyboard driven functions providing a spreadsheet.
- A complete cross development environment for programmers wishing to transfer IBM PC software from Metacomco. This will allow both new and existing application programs to be developed using the PC and then downloaded to the ST.

BBAS..link between ST and BBC

A 20-year-old student at the University of Kent has achieved a technological breakthrough to enable the ST range to run almost all programs written in BBC Basic.

Tristran Mabbs, who is studying computing, was called in by Atari because he is considered to be an expert on the BBC Micro.

Although a prototype of his BBAS Basic Interpreter was on display at the PCW Show, Tristran is currently ironing out the bugs prior to its anticipated release later this month.

"It provides an environment that has deliberately been made as close as possible to that of a BBC computer", he told *Atari User*.

"Thus programs written for the BBC Micro should run directly on the ST, provided that they do not use machine code routines other than those provided by the operating system".

Despite the close likeness to the BBC environment, the user of BBAS still has access to special features of the ST, including windows and the mouse.

"These features are integrated into the pseudo operating system so that existing programs may easily be modified", explained Tristran.

"Naturally, though, this means that these modified programs will not run correctly if copied back to BBC machines".

A GREAT deal has already been written about Jack Tramiel, chairman of the Atari Corporation. And as so often happens with coverage of such larger than life celebrities, fiction has often tended to taint the facts.

So when Mike Cowley was granted an exclusive interview with Jack Tramiel he set out to discover the man behind the myth.

TO some, he's the saviour of the world computer industry by providing people with what they want – at a price they can afford.

After all, the ex-inmate of Auschwitz built Commodore into a billion dollar business by offering value for money.

Now he's doing the same for Atari.

But to others he is little more than a ruthless opportunist with all the niceties of a contemporary Attila the Hun.

However it was simply a balding, rotund middle aged man who rose to greet me in a private room behind the Atari stand at the PCW Show in London.

The success of the ST launch ballyhoo going on outside had obviously permeated the inner sanctum. Jack Tramiel was beaming as he extended a pudgy hand in welcome.

It is difficult to imagine that here is a man who can axe two thirds of the Atari workforce within days of taking over without batting an eyelid.

Or that he has been locked in some of the bloodiest board room battles the industry has ever seen, walking away from most the undisputed winner.

But on closer inspection it's the eyes that seem to hold the key to Jack Tramiel. Heavily hooded, piercingly shrewd, the danger signs are there for all to see.

The Atari boss has never dropped his guard in public, preferring to foster the hit man image for the benefit of the media.

So in order to get a glimpse of the private Jack Tramiel, I asked him to describe a typical

Jack Tramiel

The man behind the myth



day in his life.

Here, with a few asides, is how he described it.

Each morning he sleeps in late – or so he sees it – until around 8am. "That's one luxury I allow myself", he says.

Surprisingly he could be at any one of four addresses and still qualify to be getting up at home.

The reason for this is that he is a self confessed house collector, owning three homes in the United States and a condominium in Toronto, Canada.

More likely than not he'll be at his sumptuous Lake Tahoe home some 7,500 feet above sea level.

Or there again, he could be at his residences in either Sarratoga, just 20 minutes drive from his office, or Santa Cruz, overlooking the Pacific Ocean.

"I choose the home I'm at on the basis of who I have to see on business", he confided.

But does that not get rather confusing for his wife?

"Not really", he replied. "My children have grown up, so my wife Helen, who is also my partner, travels with me wherever I go".

He usually breakfasts simply on half a grapefruit, yoghurt and coffee.

"I travel an awful lot so when I'm at home, I'm always trying to diet", he admits.

The Atari chief also uses his breakfast period to catch up on the business world by reading the Wall Street Journal. However he always puts half an hour aside to talk to Helen.

From Lake Tahoe he is flown by private plane to Santa Fe airport and then drives himself to the Atari headquarters.

Once in his office he is brought up to date on what the current problems are and decides which one to tackle that day.

"It could be anything from purchasing to designing, production to distribution", he says. "I like to be involved in the total business.

"You see I'm a generalist, not a specialist. Although I understand the engineering from the layman's viewpoint, I could not design a computer myself.

"That's why I'm lucky to have three sons who are specialists. And it's very nice to have the family involved".

Having arrived at the office at around 9.30am he goes through matters raised by his secretary, then starts to contact the outposts of his empire by phone or computer.

"I do not believe in mail", he insists, "after all, we are in the communications and information world".

Each day when at the office he usually holds a working lunch with his management team – but only when they are free of potential customers.

They drive some five minutes from the office to eat always at the same place, a seafood restaurant.

Jack Tramiel again dines sparingly at lunch – usually a piece of halibut – does not allow himself alcohol, not even a glass of wine.

"I do not drink most of the time because I suffer from gout", he says.

Back in the office he spends up until 7pm making phone calls out to the Far East to his manufacturing facilities.

Most days he will dine with a customer in the evening before returning to one of his homes.

It is only then that Jack Tramiel insists on having some time alone, relaxing by reading computer magazines, including his own copy of *Atari User*.

Although he admits he never really turns off as far as business is concerned, he does have one hobby, deep sea fishing. And he's proud of his biggest catch ever, a seven foot Blue Marlin.

But does his wife not get irritated by his strict working regime?

"I always try to have her around me to make up for it", he admits, "but I still get heat from her every now and again. That's only natural".

Jack Tramiel admits to two real loves in his life, his business and his family.

But he provided a fascinating insight into his true character the day he fired his eldest son Sam, now president of Atari.

"He felt money grew on trees, so I fired him", he recalls. "So he went into business on his own.

"One day he went to write a cheque to pay his payroll but found he had nothing in the bank.

"So he found out that money doesn't grow on trees. Now he is back working for me".

Now that is the real Jack Tramiel talking.

Atari keeps family together

FIONA Simmons' sea captain husband Tony is nearing the end of a seven month voyage to the other side of the world and back.

But all the while his ship has been sailing round the Pacific Ocean he has been only seconds away from his wife and children in Derbyshire.

This remarkable feat of communications is made possible by Mrs Simmons' Atari 800XL and modem, the MicroLink electronic mail service and the international satellite system.

She has been able to send and receive weekly telex messages that have kept the family in touch and eased the heartache of the long separation.

Before MicroLink, Mrs Simmons had to contact her husband – a Merchant Navy officer for 22 years – via the marine radio station at Portishead, near Bristol.

And although the technicians there were always very helpful this meant having to telephone her telex and have it taken down manually and sometimes having to queue to get onto the system, never being sure when the information would reach her husband on the high seas.

"With MicroLink I can do the job all by myself", Mrs Simmons told *Atari User*. "The message is transmitted in seconds to anywhere in the world Tony might be.

"The system lets us be in contact with each other much more than before and that is very important to me living in an isolated part of the country with my three young children.

"Not only do I feel closer to my husband while he's away, if any problem crops up here I know I can have the benefit of his advice within a short time via his ship's telex facility".

Mrs Simmons said she had been pleasantly surprised to find out how easy it was to use her Atari to send telex messages.

"I'm by no means a computer expert", she said. "In many ways I have been having to learn from my mistakes, such as occasionally truncating a message unintentionally and somewhat exceeding my telephone budget.

"But I can't speak too highly of the MicroLink help line team. They have been absolutely super, taking a lot of time and trouble to put me on the right track when I was having teething troubles with the system.

"I believe a lot of women are frightened of computers, possibly because they are afraid of making embarrassing mistakes. But my advice to them is not to be – females should be just as involved in the world of computers as males.

"It was because of this belief that I bought the Atari for my daughters, so they wouldn't get left behind by the boys at their school.

"Now I'm learning along with them and loving every minute – particularly that part of computing that keeps me in such close contact with Tony".



Keeping in touch with Dad . . . Mrs Simmons and her children

32 bit launch at Comdex?

THE long-awaited 32 bit machine from Atari is almost certain to take its bow at a major American computer show in November.

Comdex in Las Vegas is being touted as the launching pad for the new computer.

Asked when it would be unveiled, Max Bambridge, Atari UK's general manager told Atari User: "Just make sure you are at Comdex in Las Vegas. There's going to be a lot happening there . . ."

Game 'breakthrough' for the ST

A TRIO of top UK software authors who have known both overnight success and overnight failure have got together again to write for the 520ST.

David Lawson, Ian Hetherington and Eugene Evans believe the megagame they have developed – Brataccas – will reestablish them at the pinnacle of the computer games world.

Once the driving force behind the Liverpool based Imagine software house, all three saw fame and fortune snatched from them when the company spectacularly crashed with staggering debts last year.

"We are on our way back with this", David Lawson, who claims to have personally lost £350,000 in his company's crash, told *Atari User*.

In all, it has taken the authors some four months to write the 400,000 lines of machine code needed for Brataccas.

An adventure game, it is being hailed as a technological breakthrough in that it allows the players to become characters in a seemingly infinite number of cinema type roles.

"We always wanted to create our own movies", says David Lawson. "So we've done just that and put it on a computer. We just drop the player into it".

But will success once again spoil the lads from Liverpool if Brataccas goes as well as they believe it will. After all, they are the first to admit that back in the days of Imagine, the money simply went to their heads.

This time it looks unlikely. For the software house for which they now work, Psygnosis, is firmly in the control of Talbot Smith, a hard headed Merseyside entrepreneur.

His empire stretches from steel stockholding to haulage .

"This time when success comes the lads' way courtesy of the 520ST, I'll be holding on to the purse strings", he told *Atari User* meaningfully.

More on the way

ATARI has three more computers in the pipeline to follow the successful launch of the 520ST and 260ST machines. This was revealed by chairman Jack Tramiel during his recent visit to London. "We are already working on three new machines that will be better than the ST", he told *Atari User*. "We will not allow ourselves to get stale".

Understanding the ST

Following the launch of the Atari 520ST we can expect to see many books devoted to every aspect of the machine. Here we present extracts from the first such book – "The Atari ST Companion" by Jeremy Vine, published by Sunshine Books.

The exciting ST

WHERE do you start when describing a machine that has been hailed by the press in the most glowing terms? Rarely has one machine caught the imagination of so many people, both within the computer industry and externally.

The Atari ST has been described in superlatives since it was announced and the chances are if you're reading these words, you agree too!

What makes the ST exciting, beyond all else that has gone before and for that matter for the future, as far as one can tell, is the sheer range of applications the machine can

A guided tour of the hardware

THE ST has been hailed as the "power without the price", but what exactly is that power? This section is designed to guide you around the insides of your ST system.

Understanding how a computer works is not essential to using a machine – you could quite happily never know what's inside 'that box' and still make the most of your micro.

However, understanding the workings of a micro is not as horrific an idea as it seems and can go a long way to enhancing the user's understanding of and interaction with the machine.

Many users new to computing find it hard to imagine what is actually happening when they press a keyboard button (or mouse!) and feel they are communicating with an alien presence. What we aim to do is give you an idea of what each component part does and how it interacts with the rest of the machine.

The ST series of micros is based around the Motorola MC68000 microprocessor, which can be considered as the heart of the machine.

Much is made of whether these chips are 32 or 16 bit in size. The 68000 has an internal structure of 32 bits but externally the arrangement is 16 bit. The 68000 in the ST contains a 24-bit address bus and a 16-bit data bus.

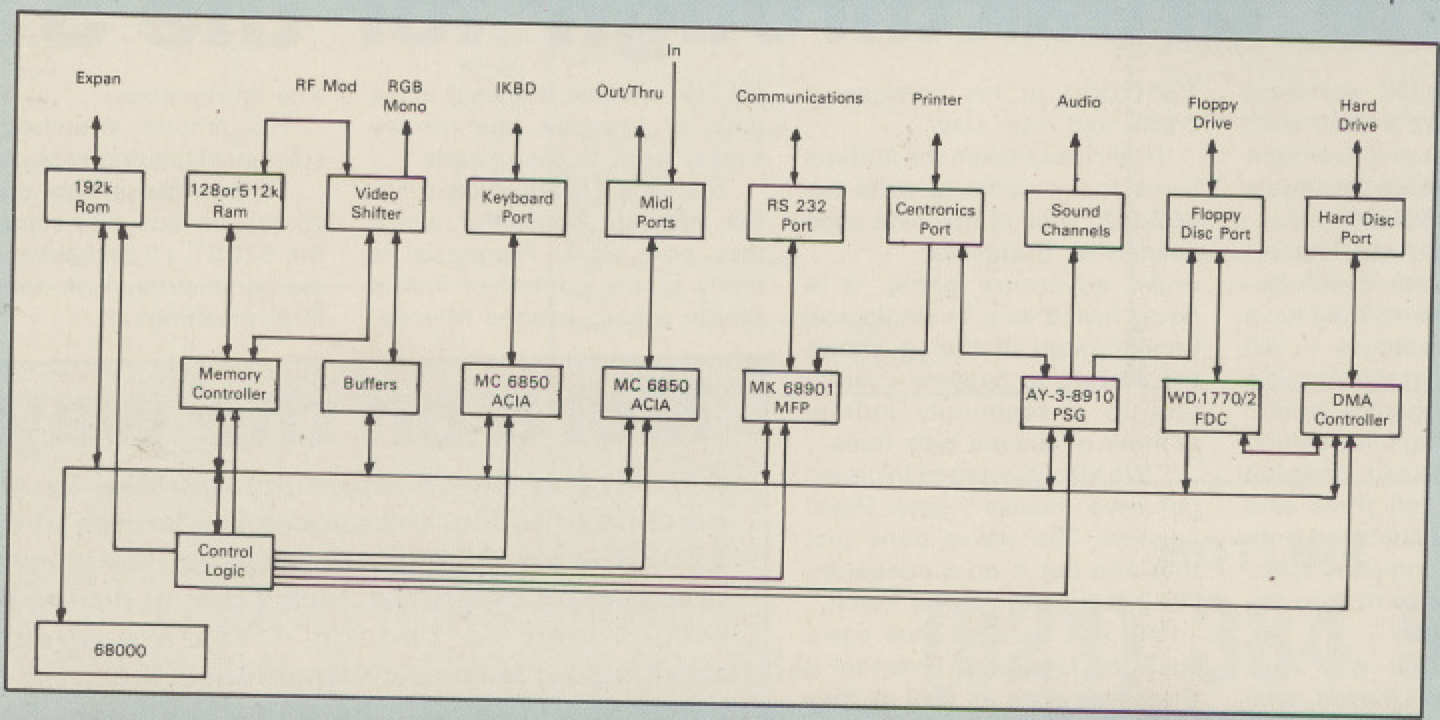
The chip is very fast, running at a clock speed of 8MHz. This speed is especially impressive when compared with other systems.

The MC68000 CPU (Central Processing Unit) chip has eight 32 bit data registers, nine 32 bit address registers, 14 addressing modes, memory mapped I/O and a 56 word instruction set. In addition, the chip can address 16 mbytes of memory directly without any need of bank switching.

Supporting the CPU is the MK68901 MFP (Multi Function Peripheral), which sorts out various interrupt control measures (Interrrupt tables are shown later in this section).

Atari have designed their own custom built microprocessors, of which there are four. These chips are a DMA (Dynamic Memory Access) controller for use with a hard disc.

The purpose of the DMA is to look after mass storage and this directly interfaces with a very fast parallel port for the hard disc. The transfer rates will be up to 8 megabits a



A global view of the ST's components, taken from The Atari ST Companion

encompass.

Because of its price, the ST has a vast appeal matched only by its power. At long last there is a machine which offers state-of-the-art technology at a price which transcends the home/business market barrier which has eluded micro manufacturers until now.

The ST is as true a business machine as any on the market and with the GEM operating system as standard offers the latest in icon-based mouse control.

The Atari ST Companion is intended for a varied readership. For those new to the concepts of GEM, or indeed new to the concept of computing, this book sets out to provide you, the user, with information that will help and guide you through the first stages of using your ST.

For the more experienced enthusiast who wishes to delve deeper, the ST system is looked at in great detail including TOS, the Intelligent Keyboard Controller and a guided tour around the ST hardware. Even if you're a beginner the text has, I hope, been presented in such a way as to give you an idea of what goes on inside 'that box'.

I've called this book the 'ST Companion' because that's what I hope it will become to you. The first section covers all that is necessary to get your ST up and running. Even if you're acquainted with the idea of using a mouse, section 1 contains all the information needed for the everyday tasks of maintaining a computer system.

The rest of the book looks in detail at specific parts of the ST and provides in the first instance a library of reference material, and secondly what I hope is a better understanding of the different component parts that go towards making the ST the machine it is.

I have intended since the inception of this book that the 'Companion' should be a book that serves both as a comprehensive introduction to the ST and its workings, and as a source of reference.

second.

The DMA is also interfaced to the floppy disc drives through the WD1770/1772 FDC (Floppy Disc Controller).

The DMA removes the need for data to be moved through the main processor when it is being transferred between the main memory and a peripheral device. The main memory (RAM) access channel is shared to allow for both slow speed (250 to 500 kbits a second) and high speed (which can be up to 8 megabits a second) 8 bit device controllers.

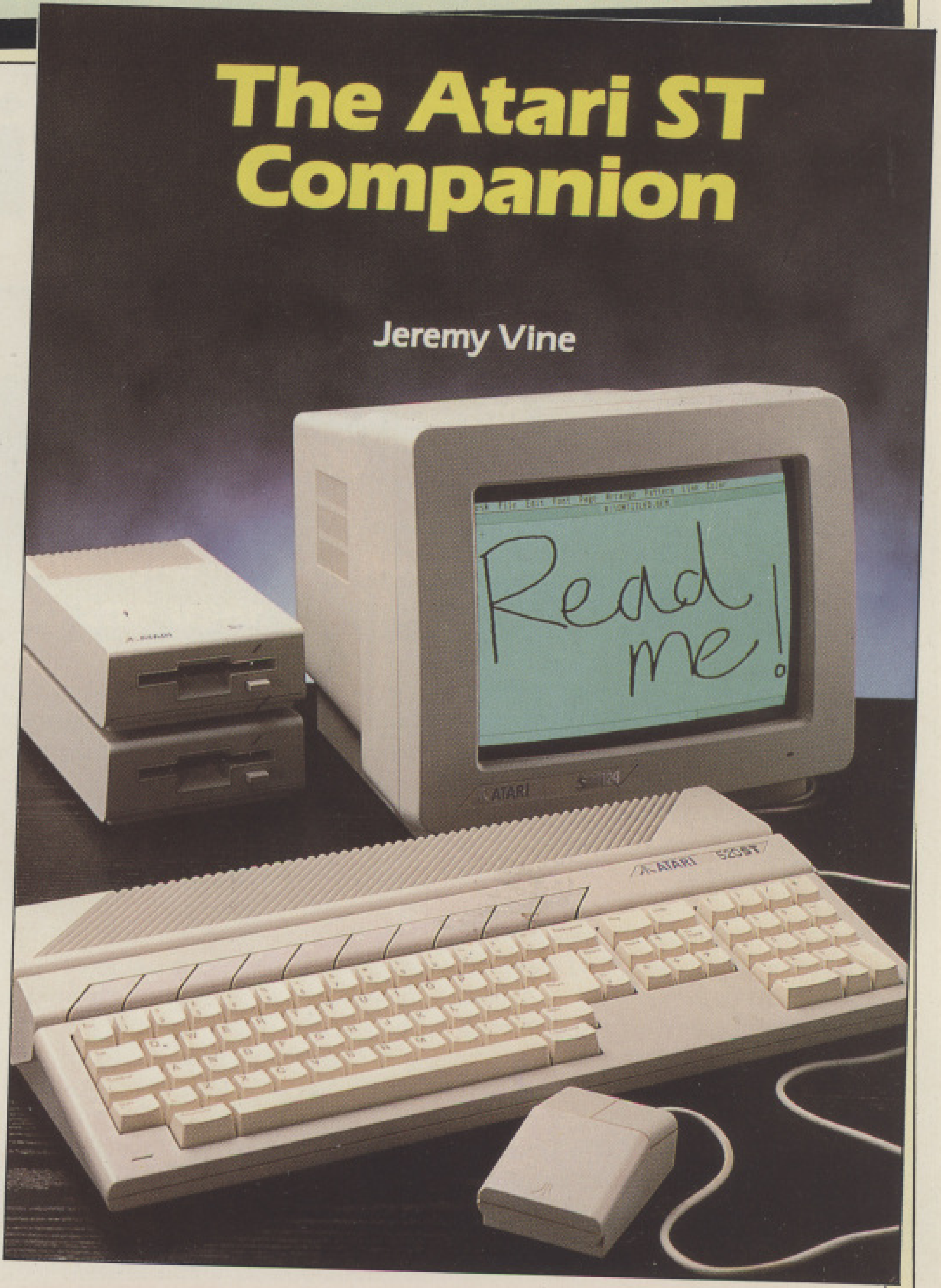
The second custom built chip is a Memory Controller unit. It can be considered as a management system for the ST's memory and some timing functions. This unit runs at a very fast 16MHz and this is put to good use.

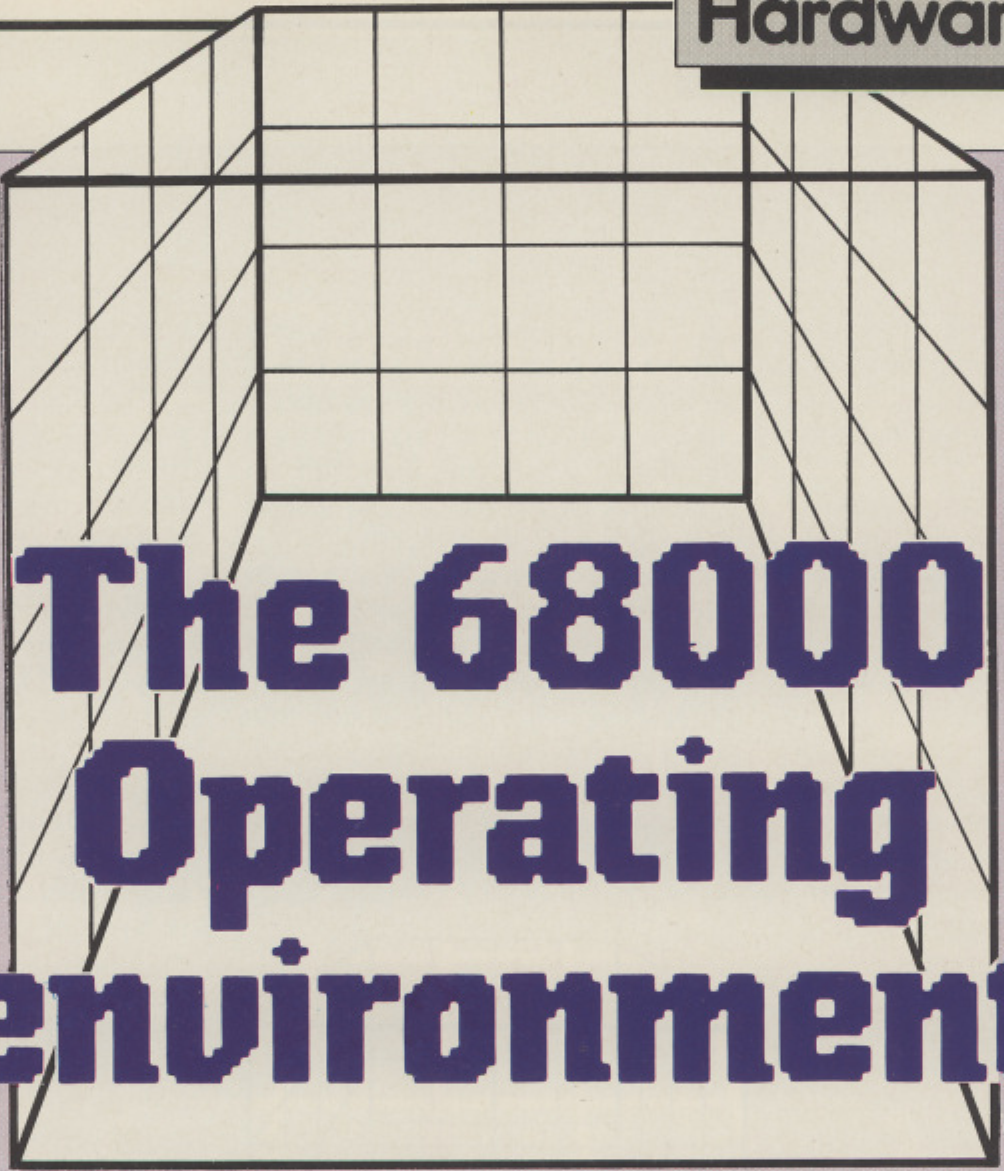
The memory controller can use memory for both the CPU and the video, without the former being slowed.

The output to video is put through the third custom chip, a Video Shifter, which is, in effect, a video controller for the screen modes provided by the ST. This chip handles all the information about graphics.

Finally, the fourth custom chip is the Control Logic. Its task is to put in order and watch over everything in the machine. The Control Logic manages the jobs that would normally be handled by TTL's, except in the case of the ST this would be a tremendous amount.

The control logic chip is in communication with almost every part of the machine and is a key element in the structure of the ST.





The 68000 Operating environment

In Part III of his series examining the powerful 68000 chip at the heart of the Atari ST, MIKE COOK explores the operating environment presented to the user

SO far we have looked at the instruction set and the addressing modes of the 68000 microprocessor. Now we'll take a look at its third significant aspect: the operating environment presented to the user.

In most other microprocessors this is so simple that it can be ignored. But in the 68000 there are so many different ways the processor can act that the design and operation of a computer is a very sophisticated affair.

Basically the 68000 can run in two modes, a supervisor mode and a user mode. In the supervisor mode there are certain privileged instructions allowed that cannot be executed in the user mode. The usual arrangement is to have the operating system run in the supervisor mode with the programs or languages running in the user mode.

It is even possible to arrange true multi-user operation using these modes. The key to understanding the usefulness of these two modes lies in the interrupt structure.

An interrupt is something which changes the normal flow of a program. All microprocessors will respond to two or three different interrupting conditions but the 68000 greatly enlarges this concept – so much so that the conventional interrupts become just a special case of the much wider concept of exceptions.

An exception means an event – that is, something happening. This triggers off the execution of a program that is said to perform exception processing. The majority of the time an exception is something which should not have happened. Exception processing can correct this or at least prevent the situation getting out of hand.

For each exception condition there is a vector. A vector is a memory location that contains the address of the exception processing routine.

Each vector has a unique address depending upon the exception. There are so many of these that they occupy the first 1k of memory in the microprocessor, each vector occupying four bytes.

The first is the reset vector, so in memory location 0 you will find the address of where to start when the machine is powered up or the reset line is pulled. This needs to be in ROM because it has to be available on power-up.

However it would be somewhat limiting to have all the exception vectors frozen in ROM where, committed to a task, they can't be changed. Therefore most computers designed with the 68000 have to switch this area of the memory map between ROM and RAM as part of the reset procedure. This makes the designing of the memory address decoding more complex than the average computer.

Exceptions can be divided into two types, internal and external. An

internal exception is one that has been generated by the program being run, and an external exception is one generated by a signal from outside the microprocessor.

All exception processing takes place in the supervisor mode. In fact the only way to enter the supervisor mode from the user mode is by an exception occurring.

Let's look at internal exceptions. If you try to access a word or long word quantity at an odd address this generates an *addressing error* exception. This is usually a result of your pointers getting out of alignment and the normal course of exception processing is to inform the user and then return to the user mode.

With a *privilege violation* exception, the processor has attempted to execute an instruction which can only be used in the supervisor mode.

There is also an *illegal op-code* exception which occurs if you try to execute something which is not an instruction. This is very useful for catching programs which have gone out of control and started executing your data.

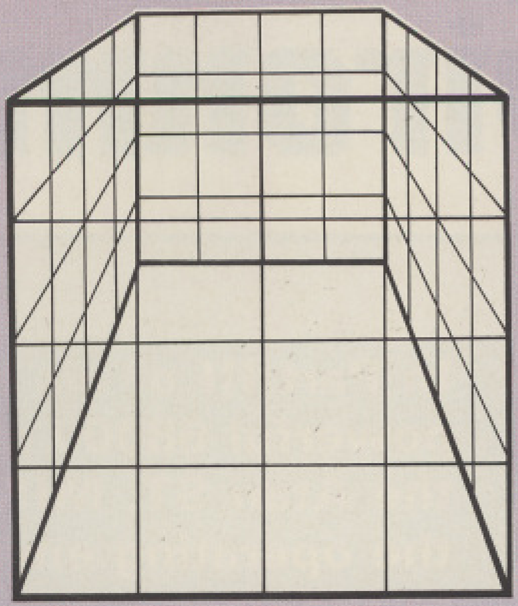
A closely allied exception is the *unimplemented op-code.* This is caused when you try to execute an instruction starting with a hexadecimal value of A or F, as no instructions actually start with these values. You can use this to write your own macro instructions.

The Apple Macintosh computer makes extensive use of this exception to allow user programs to tap into the operating system ROM. The value following the A is looked at by the exception processing routine and the appropriate operating system call is made. In this way you never need to know the address of a routine and so the same programs can work with different revisions of the operating system ROM.

There is a trace flag in the status register which, if set, causes a *trace* exception to occur after each instruction has been executed in the user mode. This makes the implementation of single stepping debuggers very simple. It will even single step through ROM, something that other microprocessors need special hardware to do.

There are also exceptions that occur when something goes wrong with an instruction. For example, if you try to divide by zero an exception will occur. Also, some overflow conditions (when the result of an operation is too big to fit in the register) will trigger exception processing.

There is, however, one set of instructions whose sole function is to cause exception processing – the TRAP instructions. There are sixteen of these, each with its own vector that can be used by the operating system for many reasons. For example, one computer uses TRAP instructions to perform all the inputs and outputs,



thus providing a consistent interface for all programs.

Of the external exceptions perhaps the simplest is the *reset signal.* When this is triggered, the processor vectors through memory location zero and enters the supervisor mode. This is used on power-up or as a panic button, hopefully situated at some remote place on the computer.

The *interrupt request* will be familiar to those acquainted with other processors. However the 68000 has three of these lines. All three are involved with the request, thus giving seven different kinds of interrupt. Each kind is given a number or level depending upon the state of these lines.

Every level has its own priority, the higher levels having higher priority. The processor can mask out levels it does not want to respond to by the use of its status register, an extension of the normal single maskable interrupt. Again each interrupt level has its own vector.

The final external exception is the *bus error* input. This is a single input to the processor and despite its name can be used for any purpose. The most common use is the detection of non-existent memory.

Most microprocessors give the external memory a certain time to respond to any request for access. If the memory device is slow it can send a signal back saying that it wants longer.

The 68000, however, works the other way round. It requests memory access and then waits for the memory to say that it is ready. This carries the disadvantage that if memory is accessed which does not exist then the whole system hangs up. So to prevent this, most 68000 based computers have a timer and if memory has not responded within (for example) one second the bus error line is triggered causing an exception.

This is not the only use of this line. There are outputs on the 68000 which reflect the type of process going on. They will, for example, indicate whether data or an instruction is being fetched from memory and whether the processor is in the user or supervisor mode.

The Sage computer uses these signals together with the address bus to trigger a bus error exception if access is made to a certain area of memory from the user mode. This area of memory contains all the input/output devices. Thus the only way to interact with the outside world is through the supervisor mode, forcing user programs to use the appropriate TRAP vectors to perform input/output operations.

As you can see, the exceptions allow a considerable degree of sophistication to be built into the operating system of any computer containing the 68000 microprocessor. It offers facilities more like a mini-computer than a microcomputer. In these three articles I have only been able to outline this complex device but I hope you now have a picture which will allow you to make sense of any book written about the 68000. It truly gives power to the programmer.

PONTOON

Try your hand at STEPHEN BOXLEY's challenging Atari card game



IF you've ever played card games the chances are that you've played Pontoon at one time or another. Maybe you called it 21, but the game remains the same. This program lets you play the game against your Atari.

After the title screen has been displayed you'll have to wait just under half a minute while the lower case alphabet is redefined to show the multicoloured numbers displayed on the cards.

Once you've entered your name you're ready to play, so roll up your sleeves and pull down the eyeshield.

The first two cards are displayed and you are asked to bet. You cannot bet a negative amount because if you lost, your score would increase – think about it!

Once you've entered your bet you have the options of twisting – getting another card – or sticking – accepting your present total. The T and S keys are used to select your choice of action.

In the version of the game played by the program, a five card trick beats everything except Pontoon itself. As is customary in gambling dens, if you and the dealer have the same hand, including Pontoon, the dealer wins.

The computer doesn't cheat – it decides whether it should twist or stick without looking at your cards.

The program was written on an Atari 800 and has been tried successfully on a 600XL, 800XL and 130XE. It runs in 16k.

MAJOR VARIABLES

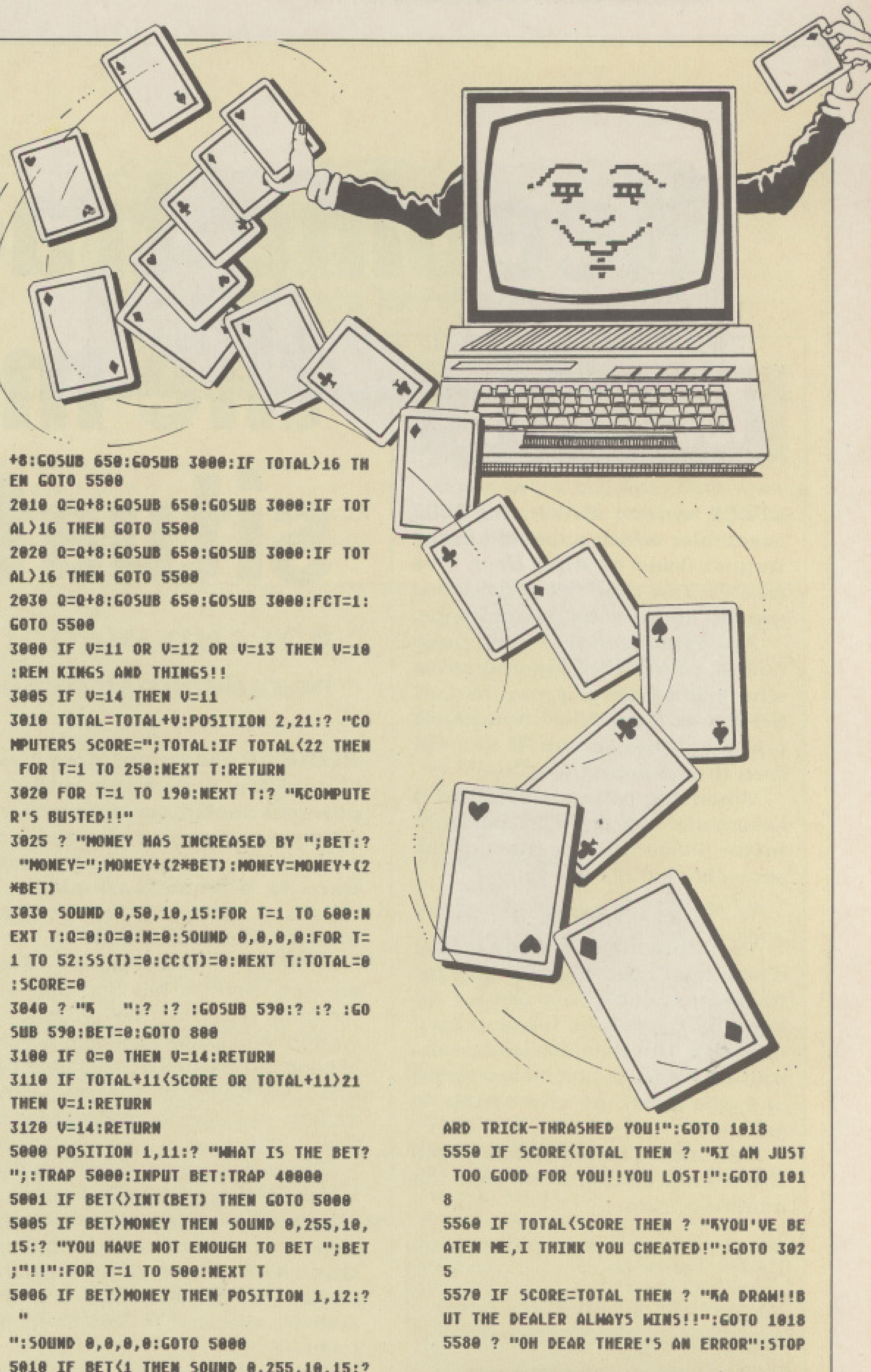
OFCT	Has human got five card trick?
FCT	Computer five card trick.
C	Card.
S	Suit.
Q	Horizontal position of card.
O	Vertical position of card.
DL	Display list.
TOTAL	Computer's score.
SCORE	Human's score.
BET	Amount bet.
MONEY	Amount of money left.

SUBROUTINES

590	Prints cards on screen.
650	Chooses a card and stores it so it won't be used again in this game.
1000	Adds up score and checks to see if you've busted.
1018	Human has lost.
2000	Computer's go.
3000	Prints computer's score.
3020	Computer busted.
3025	Computer has lost.
5000	Bet entered.
5500	Who's won?

```
 5 REM * PONTOON *
 6 REM *   by    *
 7 REM * Stephen *
 8 REM * Boxley  *
10 P=54279:R=106:S=559:G=53277:H=53248
:PC=704:DL=PEEK(560)+256*PEEK(561):A=P
EEK(R)-8:Q=1:GRAPHICS 0:HP=196
20 POKE P,A:M=256*A:POKE S,46:POKE G,3
:POKE H,HP:Y=17:POKE 81,1:MONEY=10
30 FOR I=M+512 TO M+1024:POKE I,0:NEXT
 I:FOR I=512+Y+M TO M+518+Y:READ A:POK
E I,A:NEXT I:POKE PC,55
40 DATA 8,17,35,255,32,16,8
50 FOR T=6 TO 28:POKE DL+T,4:NEXT T:PO
KE DL+3,69:POKE 709,23:SETCOLOR 2,15,1
5:SETCOLOR 0,15,15
60 DIM Z$(40):Z$="---<DEDICATED TO HAR
RIET AINLEY>       ":SOUND 0,255,4,15
70 FOR X=1 TO 37:HP=HP-4:POSITION 0,0:
? "↑":POSITION 39,0:? Z$(X,X):POKE H,H
P:NEXT X:POSITION 0,0:? "        "
80 POKE H,0:SOUND 0,0,0,0:POSITION 34,
0:? " ":FOR X=1 TO 255:SETCOLOR 2,X,12
:SETCOLOR 0,X,12:NEXT X
90 POKE DL+7,6:POKE DL+8,6:POSITION 1,
2:? "sprokkley presents":FOR I=M+512+Y
 TO M+518+Y:POKE I,0:NEXT I
95 Y=84:POKE H,40:FOR I=M+Y+512 TO M+Y
+519:READ A:POKE I,A:NEXT I:DATA 0,0,5
6,124,255,255,102,0
100 POKE PC,71:SOUND 0,215,12,10:FOR T
=40 TO 123:POKE H,T:FOR Y=1 TO 11:NEXT
 Y:NEXT T
105 FOR T=8 TO 15:SOUND 0,200,6,T:W=2^
2:NEXT T:POKE H+1,123:POKE 705,51
110 FOR Y=90 TO 83 STEP -1:READ A:POKE
 M+640+Y,A:NEXT Y:DATA 66,36,24,24,255
,24,60,24
120 SOUND 0,0,0,0:FOR T=123 TO 240:POK
E H,T:NEXT T
130 POKE DL+12,7:POKE DL+13,7:FOR T=1
TO 3:POSITION 6,6:? "pontoon!":SOUND 0
,80,0,11:FOR Z=100 TO 1 STEP -1
140 SOUND 0,Z/10,0,Z/14:NEXT Z:SOUND 0
,0,0,0:POSITION 6,6:? "           ":W=2
^2:W=2^2:NEXT T:POSITION 6,6
150 ? "pontoon!":POKE DL+15,6:POKE DL+
16,6:POSITION 0,8:? "written by: s.box
ley              1985":Y=83
160 DIM A$(24),B$(24),C$(24),D$(24),E$
(24):A$="024060024126024036066066":B$=
"024060153126024231129000"
170 C$="024189090060024036066129":D$="
024060152126025036066036":E$="02406002
4189090024036102":HP=123
180 RESTORE 200:FOR T=1 TO 54:READ A:S
OUND 0,A,10,15:SOUND 1,A*2,10,15:Z=INT
(RND(0)*5):GOSUB 191+Z:S=1:J=3
190 FOR I=640+M+Y TO 647+M+Y:POKE I,VA
L(Z$(S,J)):S=S+3:J=J+3:NEXT I:SOUND 0,
0,0,0:SOUND 1,0,0,0:NEXT T:GOTO 260
191 Z$=A$:RETURN
192 Z$=B$:RETURN
193 Z$=C$:RETURN
194 Z$=D$:RETURN
195 Z$=E$:RETURN
200 DATA 81,81,81,72,64,72,81,64,72,72
,81,0,0,81,81,81,72,64,72,81,64,72,72,
81,0,0,72,72,72,72,47,47,0,0,72
210 DATA 81,42,47,50,0,0,81,81,81,72,6
4,72,81,64,72,72,81,0,0
260 FOR T=1 TO 90 STEP 4:HP=HP+4:RESTO
RE 280+(INT(RND(0)*4)*10):FOR I=M+Y+64
0 TO M+Y+647:READ A
270 POKE I,A:NEXT I:POKE 53249,HP:SOUN
D 0,255,10,15:SOUND 0,0,0,0:NEXT T:GOT
O 320
280 DATA 24,60,24,28,26,24,20,36
290 DATA 24,60,24,30,24,24,20,26
300 DATA 24,60,24,24,62,88,24,20
310 DATA 24,60,24,24,62,88,36,34
320 POKE H,0:POKE H+1,0:FOR T=6 TO 28:
POKE DL+T,4:NEXT T:? "KWANT INSTRUCTIO
NS??":OPEN #1,4,0,"K:":POKE 709,0
330 POKE 708,55:POKE 710,55:GET #1,A:I
F CHR$(A)="N" THEN GOTO 390
340 IF CHR$(A)<>"Y" THEN ? "TRY PRESSI
NG Y or N":GOTO 330
350 ? "KINSTRUCTIONS:":? "THIS GAME IS
 EXACTLY LIKE BLACKJACK.":? "YOU HAVE
TO SCORE A MAXIMUM OF 21."
360 ? "JACKS,QUEENS AND KINGS ALL COUN
T AS    TEN.IF AN ACE COMES UP YOU HAV
E TO  "
370 ? "DECIDE THERE AND THEN WHAT YOU
WANT IT TO BE:1 or 11 BY PRESSING A or
 B":?
380 ? "HOPE YOU ENJOY PLAYING PONTOON.
":REM
390 ? :? "PRESS ANY KEY TO START":GET
#1,A:FOR T=6 TO 28:POKE DL+T,4:NEXT T:
? "K       PLEASE WAIT-INITIALIZING"
400 RESTORE 420
405 CH=PEEK(106):CH=(CH-8)*256:FOR L=0
 TO 1023:BYTE=PEEK(57344+L):POKE CH+L,
BYTE:NEXT L:? "NEARLY FINISHED!!"
410 POKE 712,48:FOR T=97 TO 122:C=T:C=
C*8:FOR L=0 TO 7:READ BYTE:POKE CH+C+L
,BYTE:NEXT L:NEXT T:POKE 756,CH/256
419 REM CHARACTER SET
420 DATA 60,195,195,195,255,195,195,19
5,252,3,3,3,12,48,192,255,255,3,3,255,
3,3,3,255
430 DATA 0,60,204,204,204,255,12,12,25
5,192,192,255,3,3,195,60,60,192,192,25
2,195,195,195,60
440 DATA 0,255,255,3,15,60,48,48,60,19
5,195,60,60,195,195,60,60,195,195,63,3
,3,12,240
450 DATA 207,207,207,207,207,207,207,2
07,255,12,12,12,12,12,204,252,60,195,1
95,195,195,195,204,51
460 DATA 195,195,204,240,240,204,195,1
95,20,65,65,65,85,65,65,65
470 DATA 84,1,1,1,4,16,64,85,85,1,1,85
,1,1,1,87,0,20,68,68,68,85,4,4,85,64,6
4,85,1,1,65,20
480 DATA 20,64,64,84,65,65,65,20,0,85,
85,1,5,20,16,16,20,65,65,20,20,65,65,2
0
490 DATA 20,65,65,21,1,1,4,80,69,69,69
,69,69,69,69,69,85,4,4,4,4,4,68,84,20,
65,65,65,65,65,68,84
499 DATA 65,65,68,80,80,68,65,65
500 RESTORE 510:FOR T=2 TO 9:C=T:C=C*8
:FOR L=0 TO 7:READ BYTE:POKE CH+L+C,BY
TE:NEXT L:NEXT T
510 DATA 255,255,255,255,255,255,255,2
55,85,85,85,85,85,85,85,85,170,170,170
,170,170,170,170,170,85,170,85,170
520 DATA 85,170,85,170,20,20,85,85,85,
20,20,85,4,4,17,17,0,4,21,21,51,63,63,
63,63,12,12,0,12,12,63,63,63,63,12,12
540 POKE 708,0:POKE 709,10:POKE 710,52
:POKE 711,255:POKE 712,8:DIM N$(15):?
"KPLEASE NOTE:"
550 ? :? "& =SPADES":? :? "' =CLUBS":?
 :? "( =HEARTS":? :? ") =DIAMONDS":? :
? "j OR w =THE NUMBER TEN[10]"
555 ? :? "YOU HAVE THE TOP ROW OF CARD
S":? :? "YOU HAVE 10 CHIPS[MONEY] TO P
LAY WITH"
556 ? :? "IF A DRAW,DEALER[THE COMPUTE
R!!]WINS!!"
560 ? :? :? "PRESS A KEY":GET #1,A:? "
KWHAT IS YOUR NAME??":INPUT N$
570 ? "K":POSITION 2,0:? "WELCOME TO P
ONTOON ";N$:? :? "PRESS A KEY":GET #1,
A:? "K"
580 POSITION 2,0:? "  ":POKE 82,1:? :?
 :GOTO 630
590 ? "$$$$$$  $$$$$$  $$$$$$  $$$$$$
 $$$$$$":? "$    $  $    $  $    $  $
   $  $    $":OFCT=0:FCT=0
600 ? "$    $  $    $  $    $  $    $
 $    $":? "$    $  $    $  $    $  $
   $  $    $"
610 ? "$    $  $    $  $    $  $    $
 $    $":? "$    $  $    $  $    $  $
   $  $    $"
620 ? "$    $  $    $  $    $  $    $
 $    $":? "$$$$$$  $$$$$$  $$$$$$  $$
$$$$  $$$$$$":RETURN
630 GOSUB 590:? :? :GOSUB 590:DIM SS(5
4),CC(54):Q=0:N=0
640 GOTO 800
650 C=INT(RND(0)*13)+1:V=C:S=INT(RND(0
)*4)+1:N=N+1:CC(N)=C:SS(N)=S:IF N=1 TH
EN 680
660 FOR D=1 TO (N-1):IF CC(D)=C AND SS
(D)=S THEN N=N-1:GOTO 650
670 NEXT D
680 IF S<3 THEN C=C+109:GOTO 700
690 C=C+96
700 POSITION 2+Q,4+O:? CHR$(C):POSITIO
N 5+Q,4+O:? CHR$(C):POSITION 2+Q,9+O:?
 CHR$(C):POSITION 5+Q,9+O:? CHR$(C)
710 POSITION 3+Q,5+O:? CHR$(S+37);CHR$
(S+37):POSITION 3+Q,8+O:? CHR$(S+37);C
HR$(S+37)
720 IF V=1 AND O=0 THEN GOSUB 1100:RET
URN
730 IF V=1 THEN GOSUB 3100
740 RETURN
800 O=0:SCORE=0:GOSUB 650:GOSUB 1000:Q
=Q+8:GOSUB 650:GOSUB 1000:GOSUB 5000:P
OSITION 0,1:POKE DL+6,2
810 ? "       TWIST OR STICK??":GET #1,
```

```
A:IF CHR$(A)="T" THEN Q=Q+8:POKE DL+6,
4:GOSUB 650:GOSUB 1000:GOTO 840
820 IF CHR$(A)="S" THEN GOTO 900
830 POSITION 0,1:GOTO 810
840 POKE DL+6,2:POSITION 0,1:? "
TWIST OR STICK?":GET #1,A
850 IF CHR$(A)="T" THEN POKE DL+6,4:Q=
Q+8:GOSUB 650:GOSUB 1000:GOTO 880
860 IF CHR$(A)="S" THEN 900
870 GOTO 840
880 POKE DL+6,2:POSITION 0,1:? "
TWIST OR STICK?":GET #1,A:IF CHR$(A)="
S" THEN 900
890 IF CHR$(A)="T" THEN POKE DL+6,4:Q=
Q+8:GOSUB 650:GOSUB 1000:POSITION 0,1:
? "FIVE CARDS IS YOUR LOT!!":GOTO 895
891 GOTO 880
895 FOR T=1 TO 400:NEXT T:OFCT=1
900 POKE DL+6,4:POSITION 0,1:? "OKAY,Y
OU STICK ON ";SCORE;"            ":? "C
OMPUTERS GO!!!          ":POSITION 0,2:
? " "
905 FOR T=1 TO 200:NEXT T:AZ=Q
910 POSITION 0,2:? "
                    ":GOTO 2000
999 END
1000 IF V=11 OR V=12 OR V=13 THEN V=10
1005 IF V=14 THEN V=11
1010 SCORE=SCORE+V:POSITION 0,2:? "SCO
RE=";SCORE;" MONEY=";MONEY;" BET=";BET
;"     ":IF SCORE<22 THEN RETURN
1015 ? "↖YOU HAVE BUSTED!!"
1018 SOUND 0,255,10,15
1020 ? "MONEY DECREASED BY ";BET;"!!!!
":? "MONEY=";MONEY:IF MONEY>0 THEN 104
0
1030 FOR T=1 TO 600:NEXT T:? "↖NO MORE
 MONEY":? "SUGGEST YOU SEE A LOAN SHAR
K!!!":? :? :SOUND 0,0,0,0:GOTO 1140
1040 FOR T=1 TO 650:NEXT T:SOUND 0,0,0
,0:Q=0:O=0:N=0:SCORE=0:TOTAL=0:FOR T=1
 TO 52:SS(T)=0:CC(T)=0:NEXT T
1050 ? "↖    ":? :? :GOSUB 590:? :? :G
OSUB 590:BET=0:GOTO 800
1100 POSITION 0,2:? "IS THIS ACE GOING
 TO BE A1  B11"
1110 POKE DL+7,2:GET #1,A:IF CHR$(A)="
A" THEN V=1:POKE DL+7,4:POSITION 8,2:?
 "                              ":RETU
RN
1120 IF CHR$(A)="B" THEN POKE DL+7,4:V
=14:POSITION 8,2:? "
           ":RETURN
1130 GOTO 1100
1140 ? "PLAY AGAIN[Y OR N]":GET #1,A:I
F CHR$(A)="Y" THEN ? "↖OKAY!!":GOTO 11
70
1150 IF CHR$(A)="N" THEN ? "↖GAME ENDE
D!!":END
1160 ? "↑↑":GOTO 1140
1170 SOUND 0,0,0,0:Q=0:O=0:N=0:SCORE=0
:TOTAL=0:FOR T=1 TO 52:SS(T)=0:CC(T)=0
:NEXT T:MONEY=10:BET=0
1180 ? "↖ ":? :? :GOSUB 590:? :? :GOS
UB 590:GOTO 800
2000 Q=0:O=10:GOSUB 650:GOSUB 3000:Q=Q
+8:GOSUB 650:GOSUB 3000:IF TOTAL>16 TH
EN GOTO 5500
2010 Q=Q+8:GOSUB 650:GOSUB 3000:IF TOT
AL>16 THEN GOTO 5500
2020 Q=Q+8:GOSUB 650:GOSUB 3000:IF TOT
AL>16 THEN GOTO 5500
2030 Q=Q+8:GOSUB 650:GOSUB 3000:FCT=1:
GOTO 5500
3000 IF V=11 OR V=12 OR V=13 THEN V=10
:REM KINGS AND THINGS!!
3005 IF V=14 THEN V=11
3010 TOTAL=TOTAL+V:POSITION 2,21:? "CO
MPUTERS SCORE=";TOTAL:IF TOTAL<22 THEN
 FOR T=1 TO 250:NEXT T:RETURN
3020 FOR T=1 TO 190:NEXT T:? "↖COMPUTE
R'S BUSTED!!"
3025 ? "MONEY HAS INCREASED BY ";BET:?
 "MONEY=";MONEY+(2*BET):MONEY=MONEY+(2
*BET)
3030 SOUND 0,50,10,15:FOR T=1 TO 600:N
EXT T:Q=0:O=0:N=0:SOUND 0,0,0,0:FOR T=
1 TO 52:SS(T)=0:CC(T)=0:NEXT T:TOTAL=0
:SCORE=0
3040 ? "↖   ":? :? :GOSUB 590:? :? :GO
SUB 590:BET=0:GOTO 800
3100 IF Q=0 THEN V=14:RETURN
3110 IF TOTAL+11<SCORE OR TOTAL+11>21
THEN V=1:RETURN
3120 V=14:RETURN
5000 POSITION 1,11:? "WHAT IS THE BET?
";:TRAP 5000:INPUT BET:TRAP 40000
5001 IF BET<>INT(BET) THEN GOTO 5000
5005 IF BET>MONEY THEN SOUND 0,255,10,
15:? "YOU HAVE NOT ENOUGH TO BET ";BET
;"!!":FOR T=1 TO 500:NEXT T
5006 IF BET>MONEY THEN POSITION 1,12:?
 "
":SOUND 0,0,0,0:GOTO 5000
5010 IF BET<1 THEN SOUND 0,255,10,15:?
 "CHEAT!!":FOR T=1 TO 200:NEXT T:SOUND
 0,0,0,0:POSITION 1,12:? "         "
5015 IF BET<1 THEN GOTO 5000
5020 POSITION 1,11:? "
                    ":POSITION 17,2:?
" BET=";BET:MONEY=MONEY-BET:RETURN
5500 POSITION 2,21:? "THE COMPUTER STI
CKS ON ";TOTAL:FOR T=1 TO 190:NEXT T
5510 IF TOTAL=21 AND Q=8 THEN ? "↖I HA
VE PONTOON,HA-HA!!":GOTO 1018
5520 IF SCORE=21 AND AZ=8 THEN ? "↖YOU
 HAVE A PONTOON!!BEATS ME!!":GOTO 3025
5530 IF OFCT=1 THEN ? "↖YOU HAVE A FIV
E CARD TRICK!I LOST.":GOTO 3025:REM
5540 IF FCT=1 THEN ? "↖I HAVE A FIVE C
ARD TRICK-THRASHED YOU!":GOTO 1018
5550 IF SCORE<TOTAL THEN ? "↖I AM JUST
 TOO GOOD FOR YOU!!YOU LOST!":GOTO 101
8
5560 IF TOTAL<SCORE THEN ? "↖YOU'VE BE
ATEN ME,I THINK YOU CHEATED!":GOTO 302
5
5570 IF SCORE=TOTAL THEN ? "↖A DRAW!!B
UT THE DEALER ALWAYS WINS!!":GOTO 1018
5580 ? "OH DEAR THERE'S AN ERROR":STOP
```



Keeping track of the memory situation

ROLAND WADDILOVE presents a hexadecimal/Ascii memory dump utility

REGULAR readers of *Atari User* should by now have quite a powerful toolkit consisting of an assembler, disassembler and data maker. To complement these, here is a hexadecimal/Ascii memory dump utility written entirely in machine code.

Although memory dump utilities are fairly common, this little routine is far from standard. The program is written in machine code and resides in page 6. This area of memory is not used by Basic or the operating system, so is free for utilities such as this.

The machine code is unaffected by LOAD, SAVE or NEW. This makes it possible to run Basic programs at the same time and examine how they are stored in the memory. The operating system can be examined and the system variables can also be monitored.

The routine displays 192 memory locations on a Graphics 0 screen in both hexadecimal and Ascii. When it has completed this task it goes back and displays the same 192 locations again. This is repeated until one of the cursor keys is pressed.

You might imagine that printing 192 memory locations in hex and Ascii would take a long time. However, remember that this is machine code. The routine updates the screen 30 or 40 times a second.

The advantage of constantly displaying the same area of memory over and over again is that locations that change are instantly updated and can be seen quite easily. The system clock, for instance, can be seen rapidly ticking away in page zero.

To monitor any section of memory enter:

```
X=USR(1536,n)
```

where *n* is the address from which to start displaying. To return to Basic press the space bar.

Pressing the cursor up key will increment the start address by 8 and the display scrolls up. Cursor down decrements the start address by 8, scrolling the screen down. The screen continues scrolling until any other key is pressed. Return is the most

```
10 REM Memory Monitor
20 REM By R.A.Waddilove
30 REM (c) Atari User
40 REM X=USR(1536,n)
50 FOR I=0 TO 235
60 READ J:POKE 1536+I,J
70 NEXT I
500 DATA 104,201,1,240,1,96,165,89,72,
169,0,168,162,4,145,88,136,208,251,230
510 DATA 89,202,208,246,104,133,89,104
,133,213,104,133,212,165,88,141,228,6,
141,202
520 DATA 6,165,89,141,229,6,141,203,6,
165,212,141,88,6,165,213,141,89,6,169
530 DATA 24,133,214,169,1,133,216,169,
31,133,215,173,89,6,32,207,6,173,88,6
540 DATA 32,207,6,230,216,162,0,189,21
```

Program I

UPDATE

SINCE writing RAW, the 6502 assembler which appeared in the August issue of *Atari User*, I've made a few modifications which greatly improve its performance.

An extra variable has been added, *SHOW*. This indicates whether a listing is required. If *SHOW* is zero then nothing is printed on the screen. If it is not zero then a listing is given.

When the listing is disabled it assembles the code 25 per cent faster. Place it at the start of the assembly listing like this:

```
10 SHOW=0
```

The other major change is that it no longer uses any of page 6 for its workspace. This leaves an extra 55 bytes free for your own routines. The machine code subroutine it uses is placed in a string and the start of the string is called.

To convert the assembler, load it and enter Listing I then save the modified form.

```
5017 ? "Assembling..."
5030 REM Deleted
5090 IF SHOW THEN POKE 85,20:? A$:X=IN
T(P/256):GOSUB 6500:X=P-256*X:GOSUB 65
00:? ":";
5110 IF A$="END" THEN ? :GOTO 5400
5410 ? "Start=";START;"  Length=";P-ST
ART;"  End=";P-1
6130 X=USR(ADR(CODE$),ADR(T$),ADR(L$))
6500 IF  NOT SHOW THEN RETURN
7190 BYTE=USR(ADR(CODE$),ADR(A$),ADR(M
$))
7320 GOSUB 6010
7330 IF N=3 THEN BYTE2=INT(X/256):BYTE
1=X-256*BYTE2:X=BYTE1:GOSUB 6500:X=BYT
E2:GOSUB 6500:RETURN
9010 DIM A$(15),T$(5),M$(16),L$(1024),
V(255),Z(3),CODE$(60)
9080 RESTORE 9090:FOR I=0 TO 54:READ J
:POKE ADR(CODE$)+I,J:NEXT I
```

Listing I

convenient key to stop.

The scrolling is very fast. The routine takes about three seconds to whizz through 1k of memory, so it's very easy to move backwards or forwards through RAM or ROM.

There's quite a lot to be learned by scanning the memory using the monitor. Try looking at page 0 first. The clock can be seen ticking away at $12-$14. Every time $14 reaches 0 $4E is incremented. Press a key and $4E is reset to zero.

Page 1 is the 6502 stack. This can be seen to be flashing quite rapidly as data is pushed on and pulled off.

$22B is interesting. When a key is pressed the delay before auto repeat comes into operation is placed here. This counts down to zero, and if the key is still being pressed the auto repeat delay is placed here. Again this counts down to zero.

The Basic line buffer is around $580. You can see here what you've just typed in.

Basic programs are stored at around $1F30 on my Atari 800 XL with disc drive. It may be different on other Ataris.

If you want to use RAW to enter the assembly listing you'll need to use the modified version. An alternative is to assemble the routine at a different memory location.

The routine is quite complicated and needs entering with care. Program I will poke the data into page 6 and set up the routine. Program II is an assembly listing for anyone with an assembler.

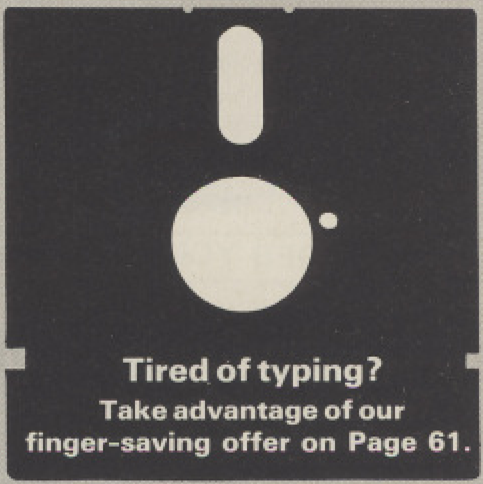
‘The golden rule of machine code programming – always save it twice before running it until you know it's bug-free’

Remember the golden rule of machine code programming – always save it twice before running it until you know it's bug-free. After setting up the routine you can type NEW and load a Basic program.

```
0,4,32,191,6,230,216,232,224,8,208,243
550 DATA 24,173,88,6,105,8,141,88,6,17
3,89,6,105,0,141,89,6,24,173,228
560 DATA 6,105,40,141,228,6,141,202,6,
173,229,6,105,0,141,229,6,141,203,6
570 DATA 198,214,208,175,173,252,2,201
,14,208,16,24,165,212,105,8,133,212,16
5,213
580 DATA 105,0,133,213,76,33,6,201,15,
208,15,165,212,233,8,133,212,165,213,2
33
590 DATA 0,133,213,76,33,6,201,33,208,
249,96,72,201,96,176,3,56,233,32,164
600 DATA 215,153,210,4,230,215,104,72,
74,74,74,74,32,216,6,104,164,216,41,15
610 DATA 248,24,105,144,105,32,216,153
,210,4,230,216,96,0,0,0,0,0,0,0
```

```
1 SHOW=0
10 DATA ORG $600
20 REM
30 DATA .mal=$D4,.mah=$D5
32 DATA .line=$D6
33 DATA .pp1=$D7
34 DATA .pp2=$D8
40 DATA .addl=$658,.addh=$659
50 DATA .chrl=$6CA,.chrh=$6CB
60 DATA .pl=$6E4,.ph=$6E5
65 REM
70 DATA PLA,CMP #1,BEQ ok,RTS
73 DATA .ok,LDA 89,PHA
75 DATA LDA #0,TAY,LDX #4
77 DATA .wipe,STA (88).Y,DEY,BNE wipe
80 DATA INC 89,DEX,BNE wipe
83 DATA PLA,STA 89
100 DATA PLA,STA mah,PLA,STA mal
105 DATA .strt
110 DATA LDA 88,STA pl,STA chrl
120 DATA LDA 89,STA ph,STA chrh
130 DATA LDA mal,STA addl
140 DATA LDA mah,STA addh
150 DATA LDA #24,STA line
160 DATA .here
165 DATA LDA #1,STA pp2,LDA #31,STA pp
1
170 DATA LDA addh,JSR prnt
180 DATA LDA addl,JSR prnt
182 DATA INC pp2
190 DATA LDX #0
200 DATA .loop
210 DATA LDA 1234.X,JSR prin
215 DATA INC pp2
220 DATA INX,CPX #8,BNE loop
225 DATA CLC
230 DATA LDA addl,ADC #8,STA addl
240 DATA LDA addh,ADC #0,STA addh
244 DATA CLC,LDA pl,ADC #40,STA pl,STA
 chrl
246 DATA LDA ph,ADC #0,STA ph,STA chrh
250 DATA DEC line,BNE here
280 DATA LDA 764,CMP #14,BNE k1
290 DATA CLC,LDA mal,ADC #8,STA mal
300 DATA LDA mah,ADC #0,STA mah
310 DATA JMP strt
320 DATA .k1
330 DATA CMP #15,BNE k2
340 DATA LDA mal,SBC #8,STA mal
350 DATA LDA mah,SBC #0,STA mah
355 DATA .k3
360 DATA JMP strt
370 DATA .k2
380 DATA CMP #33,BNE k3,RTS
390 REM
400 DATA .prin
401 DATA PHA
402 DATA CMP #96,BCS ok1,SEC,SBC #32
404 DATA .ok1,LDY pp1,STA 1234.Y,INC p
p1,PLA
410 DATA .prnt
419 DATA PHA
420 DATA LSR A,LSR A,LSR A,LSR A
430 DATA JSR pr
440 DATA PLA
450 DATA .pr
455 DATA LDY pp2
460 DATA AND #$0F
470 DATA SED,CLC,ADC #$90,ADC #$20,CLD
490 DATA STA 1234.Y
495 DATA INC pp2
500 DATA RTS
590 REM
600 DATA END
```

Program II





What it offers

Give your micro mainframe power

With MicroLink your micro becomes a terminal linked directly to the Telecom Gold mainframe computer, and able to tap its tremendous power and versatility. Right away you'll be able to use giant number-crunching programs that can only run on a mainframe. You can set up your own computerised filing systems, store and update statistics and other information, cross-reference material between files, selectively extract the information you want, perform massive calculations and design reports to display information from any of the files and in any format you choose.

The biggest bulletin board of them all

The number of bulletin boards is growing rapidly. New ones are springing up in all parts of Britain and all over the world, with people of like minds chatting to each other on all manner of subjects. The only snag is that the vast majority are single-user boards – which means lots of other people are also trying to make contact and all too often all you get is the engaged tone. But with the MicroLink bulletin board there is no limit to the number of people using it at the same time. And no limit to the number of categories that can be displayed on the board.

We're only a local phone call away

More than 96 per cent of MicoLink subscribers can connect to our mainframe computer in London by making a local phone call. This is possible because they use British Telecom's PSS system, which has access points all over Britain. A local phone call is all you need, too, for access to the international Dialcom system through MicroLink.

Telemessages – at a third of the cost

The modern equivalent of the telegram is the telemessage, which if sent before 8pm is delivered by first post the following day (except Sunday). Originally designed for people to phone their message via the operator, the service costs £3.50 for 50 words. Now it's available via MicroLink – and costs only £1.25 for up to 350 words!

Send and receive telex messages

With MicroLink you can turn your micro into a telex machine, and can send and receive telex messages of any length. You will be able to communicate directly to 96,000 telex subscribers in the UK, 1½ million worldwide – and even with ships at sea via the telex satellite network. Business people can now send and receive telexes after office hours, from home or when travelling. You can key in a telex during the day and instruct MicroLink not to transmit it until after 8pm – and save 10 per cent off the cost!

The mailbox that is always open

MicroLink is in operation 24 hours a day, every day. That means you can access your mailbox whenever you want, and from wherever you are ... home, office, airport – even a hotel bedroom or golf club! No-one needs to know where you are when you send your message.

What does it all cost?

Considering all the services you have on tap, MicroLink is remarkably inexpensive. You pay a once-only registration fee of £5, and then a standing charge of just £3 a month. On-line costs are 3.5p a minute (between 7pm and 8am) or 10.5p a minute during office hours. There is an additional 2p a minute PSS charge if you are calling from outside the 01- London call area. Charges for telex, tele-messages and storage of files are given on the next page.

How much it costs to use MicroLink

Initial registration fee: £5.

Standing charge: £3 per calendar month or part.

Connect charge: 3.5p per minute or part – cheap rate; 10.5p per minute or part – standard rate.
Applicable for duration of connection to the Service. Minimum charge: 1 minute.
Cheap rate is from 7pm to 8am, Monday to Friday, all day Saturday and Sunday and public holidays; Standard rate is from 8am to 7pm, Monday to Friday, excluding public holidays.

Filing charge: 20p per unit of 2,048 characters per month.
Applicable for storage of information, such a telex, short codes and mail files. The number of units used is an average calculated by reference to a daily sample.

Information Databases: Various charges.
Any charges that may be applicable are shown to you before you obtain access to the database.

MicroLink PSS service: 2p per minute or part (300 baud); 2.5p per minute or part (1200/75 baud).
Only applies to users outside the 01- London call area.

Telex registration: £10.

Outgoing telex: 5.5p per 100 characters (UK); 11p per 100 (Europe); 16.5p per 100 (N. America); £1.15 per 400 (Rest of world); £2.75 per 400 (Ships at sea).
Deferred messages sent on the night service are subject to a 10 per cent discount.

Incoming telex: 50p for each correctly addressed telex delivered to your mailbox. Obtaining a mailbox reference from the sender incurs a further charge of 50p.
It is not possible to deliver a telex without a mailbox reference. If a telex is received without a mailbox reference the sender will be advised of non-delivery and asked to provide a mailbox address.
Each user validated for telex and using the facility will incur a charge of 6 storage units a month. Further storage charges could be incurred depending on the amount of telex storage and the use made of short code and message file facilities.

Telemessages: £1.25 for up to 350 words.

Radiopaging: No charge.
If you have a BT Radiopager you can be paged automatically whenever a message is waiting in your mailbox.

International Mail: For the first 2,048 characters – 20p to Germany and Denmark; 30p to USA, Australia, Canada, Singapore, Hong Kong and Israel. For additional 1,024 characters – 10p; 15p.
These charges relate to the transmission of information by the Dialcom service to other Dialcom services outside the UK and the Isle of Man. Multiple copies to addresses on the same system host incur only one transmission charge.

Billing and Payment: All charges quoted are exclusive of VAT. Currently all bills are rendered monthly.

Software over the telephone

MicroLink is setting up a central store of software programs which you'll be able to download directly into your micro. The range will include games, utilities, educational and business programs, and will cover all the most popular makes of micros.

Talk to the world – by satellite

MicroLink is part of the international Dialcom network. In the USA, Australia and a growing number of other countries there are many thousands of users with electronic mailboxes just like yours. You can contact them just as easily as you do users in Britain – the only difference is that the messages from your keyboard go speeding around the world via satellite.

What you need to access MicroLink

You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem (it can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud), and appropriate communications software.

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TELECOM GOLD*

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AT 10

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(✓) ☐ I also wish to use Telex. I authorise you to charge an additional £10 to my initial bill for validation.

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Date ______________

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FOR OFFICE USE ONLY:
Mailbox assigned ______________
Start date ______________
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Database Publications
Europa House
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Hazel Grove
Stockport SK7 5NY.

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Allow 10 days for validation of mailbox

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Whilst Database Publications Ltd is the supplier of all the services to you, the commission and billing thereof will be handled by Telecom Gold as agents for Database Publications Ltd.
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I/We authorise you until further notice in writing to charge to my/our account with you on or immediately after 15th day of each month unspecified amounts which may be debited thereto at the instance of British Telecommunications plc – TELECOM GOLD by Direct Debit. Bills are issued 10 days before debit is processed.

Name of Account to be debited ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Account Number ☐☐☐☐☐☐☐☐

B. Please debit my/our Access/Visa account number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

I/We authorise you until further notice in writing to charge to my/our account with you on or immediately after 15th day of each month unspecified amounts which may be debited thereto at the instance of British Telecommunications plc – TELECOM GOLD. Bills are issued 10 days before charge is applied to your account.

C. Please invoice the company/authority.
(✓) ☐ If you select this option, which is ONLY AVAILABLE to government establishments and public limited companies, you will be sent an authorisation form for completion which will require an official order number to accept unspecified amounts.

Mode 8 offers superb detail, but it really is a right little memory muncher

THIS month we're going to look at Mode 8, which has the highest resolution of all the modes. In its full-screen form, Mode 8 offers 192 rows × 320 columns – or, to put it another way, 61440 pixels.

With this many pixels, we can't "afford" any memory to hold colour information, so we can only display a single colour, although the border and background can be different colours.

Plotted points are the same colour as the background, but we can set the luminance of the plotted points – just as well really, otherwise we'd never see them . . .

Colour register 2 controls the colour and luminance of the background. Type GR.8 to get to an empty Mode 8 screen. It looks like a regular Mode 0 screen but the word Ready is positioned close to the bottom. Now enter:

SETCOLOR 2,4,6

and the screen will turn purple.

To demonstrate that you *do* have Mode 8 and not Mode 0, press Return three times. All text has now disappeared out of the text window, leaving only the cursor on the bottom line.

The colour and luminance of the border are controlled by register 4. We can demonstrate this by entering:

SETCOLOR 4,8,2

which should yield a blue – colour 8 – border with luminance value of 2 around the purple screen.

If we want to plot to the screen, we still need to precede the PLOT command with a COLOR 1 command. In Mode 8 this gives the same colour as the background but takes the luminance from colour register 1.

Try entering:

**COLOR 1: PLOT 20,20:
DRAWTO 100,100**

This should produce a thin sloping line which is a bit faint and therefore difficult to see.

To improve visibility, we need to make the line's luminance either much lighter or much darker. That is, we need to increase the contrast between the line and the background.

The luminance of plotted points is taken from the information in register 1, so to get a darker line we can either:

SETCOLOR 1,1,2

and to get a lighter line we can enter:

SETCOLOR 1,1,14

Notice that the text in the text window is the same luminance as the plotted points. It goes dark and light as the line goes dark and light.

You'll remember that the second parameter in the SETCOLOR command specifies the colour to be used. However in Mode 8 the colour specified in register 1 is ignored. Only the luminance parameter is used.

This means that you can use any number. Try:

SETCOLOR 1,12,14

and you shouldn't see any difference. Hence, I tend to use a 1 as the colour parameter because my fingers are already at the 1 key in order to specify the register. Lazy, aren't I?

```
10 GRAPHICS 8
20 SETCOLOR 2,0,0
30 COLOR 1
40 FOR A=100 TO 200 STEP 2
50 FOR B=0 TO 100 STEP 2
60 PLOT A,B
70 PLOT A+1,B+1
80 NEXT B:NEXT A
```

Program I

The COLOR 2 command has the same hue and luminance as the background so it can be used to erase a section of the display as we saw last month.

For example, enter:

**COLOR 2: PLOT 20,20:
DRAWTO 50,50**

and you should see the upper section of the line disappear.

Mode 8 has at least one interesting effect that you might not predict and we can demonstrate it with the aid of Program I. Enter the listing and then Run it.

This simple program does nothing

→

Part Six of DAVE RUSSELL's Atari graphics modes series

‘Keep telling yourself that 8 is a single colour mode’

more than draw a series of vertical lines. However, you should see an effect which you might not expect to see in a single-colour mode.

In fact, it is a well-documented effect called "artifacting" and is a result of the way in which televisions handle colour.

You may have noticed the effect if you entered the Mandala program from the Microscope article in the August issue of *Atari User* since it used Mode 8 to draw the patterns. You can experiment with it by inserting a line 25 to alter registers 1 and 2.

The effect can be even more

```
10 GRAPHICS 8+16
20 SETCOLOR 1,1,14:SETCOLOR 2,0,0
30 FOR X=0 TO 318 STEP 3
40 COLOR 1:PLOT 159,0:DRAWTO X,191
50 COLOR 0:PLOT 159,0:DRAWTO X+1,191
60 NEXT X
70 GOTO 70
```

Program II

dramatic on an American television because of the different system used to produce a coloured image.

Program II gives one of the best demonstrations of the effect I've seen on a UK set, but I can't take any credit because it was written by Judson Pewther for Compute! magazine. While you're looking at it, keep telling yourself that Mode 8 is a single colour mode . . .

Incidentally, line 70 may confuse you if you've not used a full-screen mode before.

Normally, Mode 8 has a Mode 0 text window at the bottom. For any of the split-screen modes we can display a full screen by adding 16 to the GRAPHICS statement, as in line 10. This could have been written as GR.24 with the same result.

The problem with removing the text window in this way is that the system will revert to Mode 0 when the program finishes. You can see the effect by typing GR.24 when you're in Mode 0. The screen flashes as Mode 8 is displayed, but then you're back in Mode 0.

All line 70 does, then, is stop the program from ending by creating an endless loop. Press Break or Reset to get out of the loop.

Mode 8 has another characteristic which can also be used to advantage.

As a map mode, writing text is not all that easy. However, by one of those happy accidents that occur now and then, the pixel size in Mode 8 just happens to be the same as in Mode 0.

You can't "write" direct to the Mode 8 screen as you can in Mode 0, but all the data required to generate the Mode 0 characters are held in ROM.

If you've been following this series you'll remember that in the July issue we copied the data down into RAM in order to redefine some of it.

Program III uses this fact in order to put Mode 0 characters on a Mode 8 screen.

It does this by converting each character in STRING$ into internal code, finding that character in the ROM character set and then poking the data for that character directly into the screen area of RAM.

In fact, if you run Program III as listed, it suffers from exactly the problem that we discussed in July's article. We could combine the redefining program from July with Program III, but as a temporary "kludge" try adding line 145 as follows:

145 IF X=64 THEN POKE LOC+BYTE*40,0:GOTO 160

Dave Russell doesn't just *talk* about bad programming – he shows you how to do it . . .

This technique of writing the Mode 0 character data to the screen will only work with Mode 8 because the two modes have the same pixel size. However, if you're adventurous you might like to devise ways of writing text to other map modes.

After all, the data for 8×8 matrix characters are already in ROM and it seems a shame to waste them. Maybe there's a way of using them in a modified form for other modes. If you find a way, I'm sure the folks at *Atari User* would love to hear from you.

Mode 8, then, offers you the best possible resolution of your Atari modes at the cost of about 8k of RAM memory. Therefore, applications that use it will be those which need the resolution for fine drawing but don't need a lot of memory for calculations.

If you think this is an unlikely combination, look back at Ken Ward's Tablet-8 program in the August issue of *Atari User*. It's a fine example of just such an application.

```
10 DIM STRING$(10),X$(1)
20 STRING$="ATARI USER"
30 X=15:Y=80
40 GRAPHICS 8
50 SCREEN=PEEK(88)+256*PEEK(89)
60 LOC=SCREEN+Y*40+X
70 FOR CHAR=1 TO LEN(STRING$)
80 X$=STRING$(CHAR,CHAR)
90 X=ASC(X$)
100 IF X>127 THEN X=X-128
110 IF X>31 AND X<96 THEN X=X-32
120 IF X<32 THEN X=X+64
130 CHARLOC=57344+X*8
140 FOR BYTE=0 TO 7
150 POKE LOC+BYTE*40,PEEK(CHARLOC+BYTE
)
160 NEXT BYTE
170 LOC=LOC+1
180 NEXT CHAR
```

Program III

```
10 REM MANDALA
20 GRAPHICS 8+16
30 COLOR 1:PLOT 150,90
40 FOR X=0 TO 100 STEP INT(RND(0)*10+1
)
50 DRAWTO 150,190-X
60 DRAWTO 150-X,100
70 DRAWTO 150,X
80 DRAWTO 150+X,100
90 NEXT X
100 FOR DELAY=1 TO 750:NEXT DELAY
110 RUN
```

The Mandala program illustrates the artifacting effect

Odds-on favourite?

JUST opposite the factory where I served my apprenticeship were two of the three "hallowed halls". Right next door to the pub was the betting shop, and many a lunch hour was spent sliding between the two.

I was never wildly successful as you can tell from the fact that I'm writing this review from sunny Stockport and not my yacht on the Med.

Of course, the rigours of mortgages put paid to my gambling career so I was filled with nostalgia when **A Day At The Races** arrived from Anvil Software.

The game allows up to five punters to place bets on horses which then race from one side of the screen to the other.

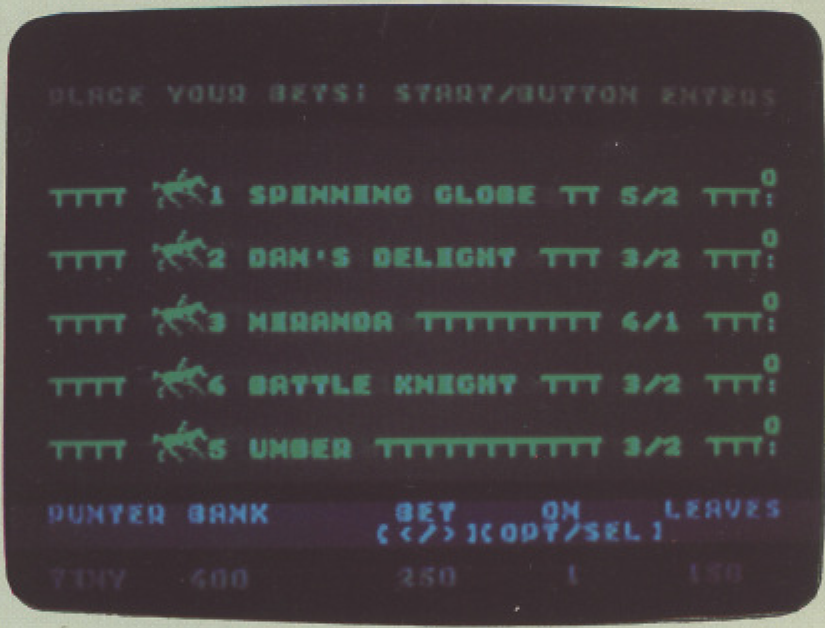
Although that may not seem very far, the animation is such that each race takes about 90 seconds with the horses appearing to have galloped all the way.

There are 10 races on each day's card. For each race the program randomly picks five horses from its database and gives the starting prices.

The odds are the only indication of form that you have, although the instruction sheet advises you to "pay careful attention to the race results to pick up hints and clues that might be useful to your future forecasts".

Once you've placed your bets, the race starts and you can do nothing more than watch. Well, that's not quite true because, like in the real thing, you can jump up and down shouting "come on", groan, and generally get involved.

Another realistic element is the fact that you can't get credit. When your money runs out, you just have to sit and watch.



A Day At The Races costs £7.99 for the cassette version and only £1 more for the disc version. I wish more software houses had a similar small difference between the two prices.

Although you could play the game on your own, I'd recommend getting a few crates of brown ale in – purely to sit on, of course – inviting a few mates round and having a bit of fun.

Cliff McKnight

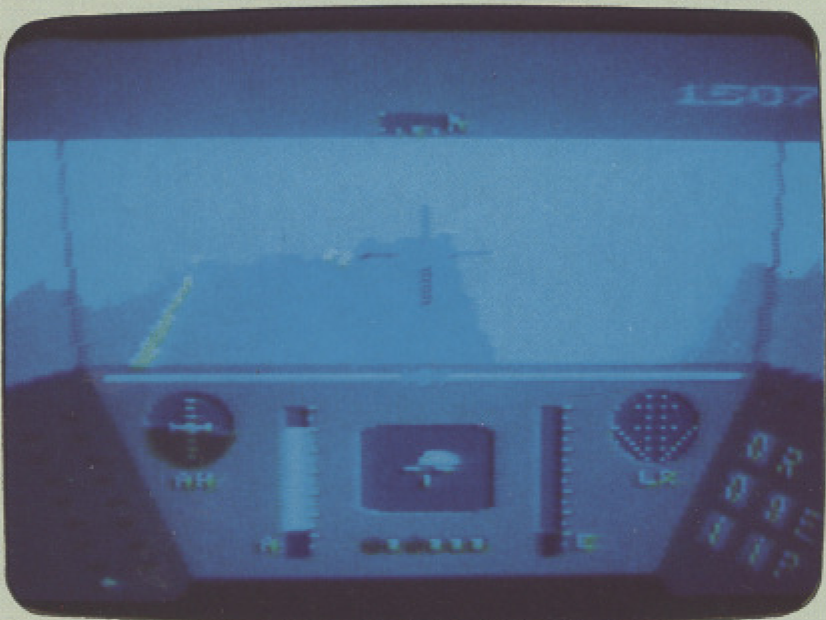
IT'S A SHOOT-EM-UP HUMDINGER

HOT from the good ol' USA comes **Rescue On Fractalus,** a superb new space shoot-em-up from Epyx and Lucasfilm Games.

The game has long been awaited – in its early form it was called Behind Jaggi Lines – but had been held up for release owing to legal problems.

Since I had heard many superlatives being bandied around about its quality, I was anxious to secure a copy as soon as it became available.

Thanks to the fast and efficient services of Software Express of Birmingham, a review copy thudded on to my doormat within hours of the game's release for the UK. Rumours of its excellence are well-founded – Fractalus is a humdinger.



The Jaggies, with whom you are at galactic war, have dug themselves in on an inhospitable planet called Fractalus. The war is not going well for you. Many of your Ethercorps pilots, including some ace officers, have found Fractalus a little beyond their capabilities and have crashed on to the planet.

You can't blame them. The terrain on Fractalus consists of wild, rugged mountains, craggy peaks and ridges, and deep canyons. The atmosphere is no less harsh – thick cyanitric acid which will dissolve a standard issue flight suit within minutes.

And as if that weren't enough, Fractalus rotates so fast that daylight only lasts for nine minutes. Barely worth getting the deck-chairs out.

Your mission is to rescue as many of your stranded colleagues as possible. As long as they stay inside their marooned single-manned fighters, they are safe. Once they venture out into the atmosphere they have only seconds to live.

The game begins with a breathtaking title screen of your mothership, one of the most impressive introductory screens I have ever seen.

Incidentally, there is a Commodore 64 version of the game available with a different title screen. The Atari screen leaves the Commodore version standing, thus confirming what we always knew about Atari software – only the best for the best!

You start inside your fighter, aboard the mothership. The display shows the forward view through the main window of your cockpit and →

below it a detailed instrument panel.

The panel gives helpful visual and aural information and warnings on such things as compass bearing, wingtip clearance from solid rock – handy for canyon flying – altitude, thrust, artificial horizon, energy, shield and air lock activation, range to stranded pilot, number of enemies destroyed and number of pilots you are expected to rescue and have actually rescued.

There's more. An altimeter shows both the altitude of the terrain and your altitude above it. A long range scanner will pick up a pilot's emergency beacon and display its position.

An enemy lock-on indicator lets you know how near you are to getting blasted by alien fire while a targetting scope helps you to draw an accurate bead on enemies and downed pilots.

This whole array appears daunting at first but it is very clearly and neatly set out and turns out to be quite simple to assimilate and interpret.

So much for the technical stuff, now to the action. Under automatic control, your ship is hurled along a tunnel at hyperspeed and descends towards Fractalus. From then on, you're in control.

Through your cockpit window you'll see a bright yellow heaven (must be all that cyanitric acid) and a skyline of ominous brown crags.

Controlling your ship is mainly a matter of joystick movement, while increases and decreases in speed are handled by the left and right arrow keys.

Any Jaggi gun emplacement shows up as a small green dome on top of a peak, firing bursts of green rays at you. You can take evasive action or try to knock it out.

A cross-hair sight will be overlaid on the scene whenever the enemy is near. To blow a Jaggi stronghold off the mountain, you must line up the cross-hair and fire one of your torpedoes.

A standed pilot is shown as a flashing green beacon on the surface of Fractalus. Watch for a blip on your long range scanner and fly low towards the pilot. Once near enough, you have to land your craft by pressing L. When down, pressing S turns your systems off and you will be told whether or not you are close enough to rescue the pilot.

If you are not, you'll just have to take off again and land a bit closer. When you're near enough, you'll see the pilot leave his ship and toddle towards you. When you hear him knocking on the door, you must open the airlock – press A – and you'll be rewarded by the sound of him stumping up the stairs.

Should you be in a malicious mood, try leaving the pilot outside. He'll start to knock more urgently, then more weakly until at last you hear him topple over. The cyanitric air has got him, you rotter!

From time to time, a beeping sound will alert you to the presence of the mothership. Pressing B fires your boosters and returns you there where you'll receive replenishment and, if you've rescued your quota of pilots, move to the next level.

When you begin a game, you can elect to start at any of 16 levels, although the game progresses way beyond these. When you complete a level, you continue at the next higher one but if you're really feeling tough or want more bonus points you can skip up to three levels at a time.

Levels 1 to 3 are for training – no sign of the Jaggies on level 1 and just a handful on levels 2 and 3. On levels 4 and above, the Jaggies are more numerous, pugnacious and accurate, and are joined by kamikaze flying saucers.

Level 16 has the Fractalus nine-minute day coming into play so prepare for some night flying. You won't see anything out of the window and must use just your instruments and nerves.

A demo mode is provided and there are some other interesting little wrinkles to the game, including one where you inadvertently pick up an alien instead of a pilot. I'll leave the pleasure of discovering these to you.

Sound effects, including the stirring theme tune, are first rate. The graphics are clean and clear and although the solid mountainous terrain is all coloured the same (brown with black ridges), the exceptionally fast, multidirectional scrolling more than compensates.

Rescue On Fractalus with its mixture of simulation and arcade elements is a top-notch game, packed with action and excitement. It will hook you from the word go and keep you coming back for more. Cost of the disc is £34.95.

Bob Chappell

Get down to the bare essentials



I'M sitting here shivering in my underwear while the young lady opposite grins smugly at me. Just a minute while I switch her off.

There, now I can concentrate. I've just been playing **Strip Poker,** the latest import from US Gold, and I'm not doing too well this time.

The program is a conversion from the Artworx classic which I first encountered on the Apple II a couple of years ago.

You have a choice of two opponents, Melissa or Suzi. On the cassette version, one is on each side of the tape. Since the loading time is about 15 minutes, I tended not to switch from one opponent to the other.

The two girls play different strategies and I'm not going to spoil your fun by revealing their styles. Both play a good game of Poker.

Although the graphics are good, only a real wierdo would buy the package to see naked ladies. Having managed to strip both opponents, I have to say that the magazines next to the computer mags in the average newsagent's leave less to the imagination.

The cassette will only run on a 64k machine and costs £9.95. It will not work on an Atari 400 or old series 800. The loading instructions tell you to press Start while you switch on, but in fact XL owners will need to press Start and Option. The disc version costs £14.95.

Otherwise the instructions are clear and the terminology used and relative values of the hands are explained adequately.

Ultimately, it's the quality of the game played that determines the value of a program. In this respect, I can recommend the game.

As far as I can tell it doesn't cheat, although you can cheat by not removing your clothes when you lose. But you wouldn't do that, would you?

Pat Cookson

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Unleash your artistic instincts and create

A masterpiece of technology

STEPHEN WILLIAMSON scrutinises the current state-of-the-art, and presents a painting program to get you started

OF all the media available to the artist, the computer is perhaps the most versatile, for no other medium gives the artist such complete control.

The VDU screen, unlike the painter's canvas, is almost infinitely flexible. Images can be created or erased instantly and, unlike the photograph or motion picture, there can be interaction between the image and the viewer.

Computer art is still in its infancy and is rarely taken seriously by the art establishment. This will probably change in the future, so that perhaps one day a computer artist will achieve the same status as a Picasso or a Goya.

It is interesting to speculate that if Leonardo da Vinci, with his interest in geometric design and science, were reincarnated today, he would be among the leaders of those artists experimenting in computer art.

The art gallery of the future may be a room full of large flat screen monitors displaying computer-generated images.

When holographic photography is perfected these displays need not be restricted to two dimensions. They could, instead, become moving three-dimensional environments through which the viewer can wander.

In the United States companies with futuristic sounding names like Digital Productions, Synthavision, Magi, and The Industrial Light and Magic Company, utilising the best

C – COLOUR	Changes the colour and brightness of the playfield according to the scheme shown in Table I.
D-DRAW	Uses joystick to plot pixels in any direction. To exit from this mode press fire button.
E-ERASE	Erase any pixel over which the centre of the cursor cross passes. Exit by pressing fire button.
F-FILL	Defines the outline of a shape using the draw or line modes. Place cursor in the middle of the shape and press the F key to colour in the shape. Complex shapes may require more than one fill command to be executed. Beware of "leaks".
L-LINE	Pressing the L key causes a pixel to be plotted at the present cursor position. Move the cursor to any other position on the screen and press the fire button. A line will be drawn from the first cursor position to the present cursor position.
1 to 3	There are three playfields or colours available. Pressing keys 1 to 3 will change the current playfield.

Keyboard Commands

Colour	Number
Grey	0
Light Orange	1
Orange	2
Red-Orange	3
Pink	4
Purple	5
Purple-Blue	6
Blue	7
Blue	8
Light Blue	9
Turquoise	10
Green-Blue	11
Green	12
Yellow-Green	13
Orange-Green	14
Light Orange	15

The brightness range is from 0 to 14

Table I

available equipment such as the Cray supercomputer, are experimenting with advanced techniques of computer graphics.

Examples of their work can be seen in the films Tron and The Last Starfighter.

In Britain many excellent examples of computer graphics can be seen on our television screens, mainly in title sequences and commercials.

The Atari user, denied access to expensive computer graphic equipment, may feel limited. In his book "Computer Images, The State of the Art", Joseph Deken includes two frames of a "moving painting" developed by researchers at Atari alongside images created by artists using far more sophisticated equipment that show something of the scope of the Atari system.

The Atari boasts the best graphics system that I have encountered in home computers thanks to the Antic and GTIA chips. Play Pole Position, Dropzone or try Jeff Minter's Colourspace program to experience some of the Atari's capabilities.

The Atari has a palette of 256 colours, though it is normally only possible to have a maximum of 16 on the screen at any one time using graphics modes 9 or 11.

Atari's trump card is the use of display list interrupts which can increase dramatically the number of colours displayed at any one time. The creative artist/programmer can create high resolution images in a multitude of colours.

As an introduction to the world of computer art I have written a graphics utility that converts the screen into a computer canvas on which the budding computer Picasso can draw his or her pictures.

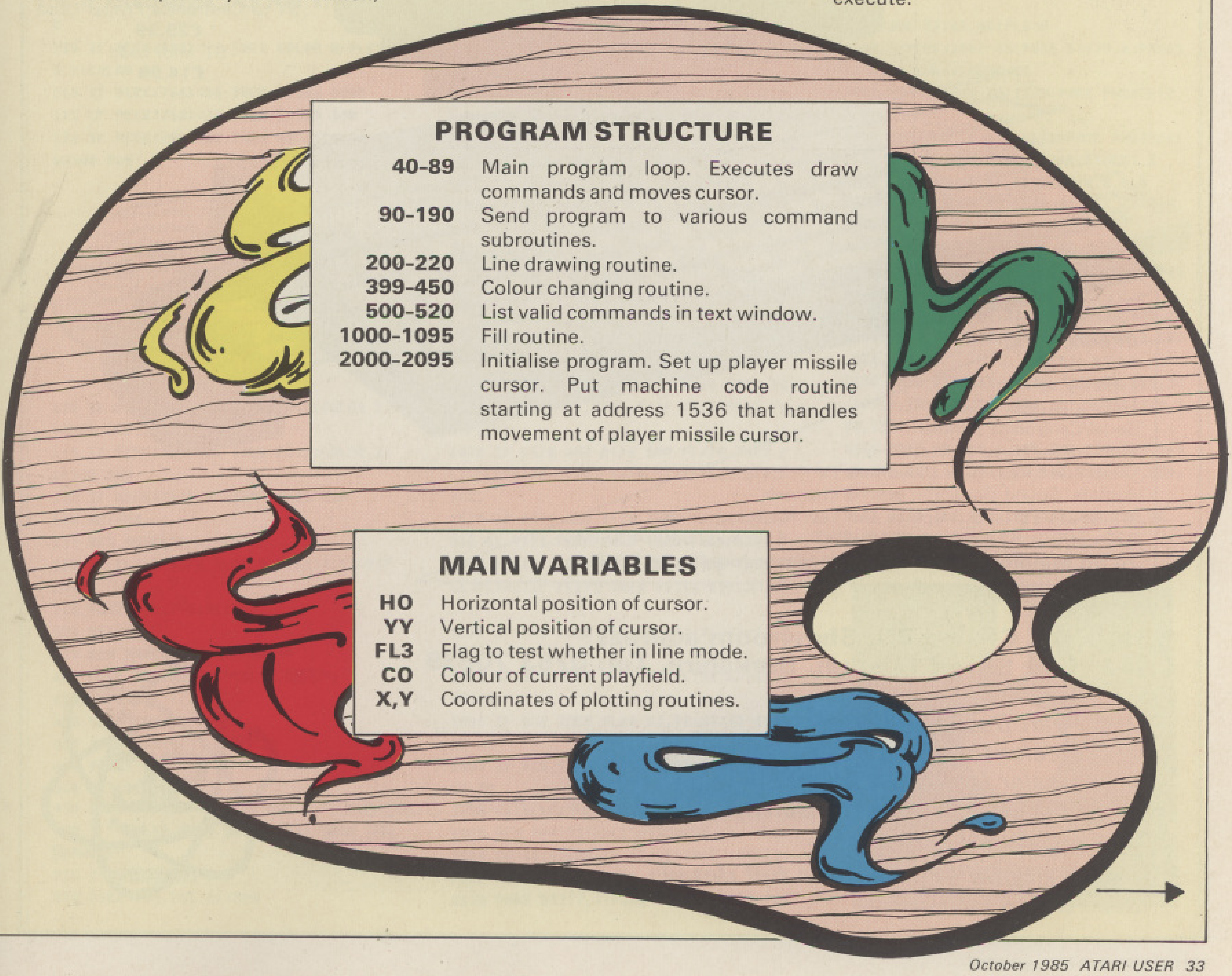
The program, though fairly simple and a little slow, being in Basic, displays some of the principles of the computer graphic workstations that professional computer artists work with.

On first running the program a graphics mode 15 screen (160 x 160 pixels) is set up and a small cross will appear at the top left hand corner of the screen.

This is a player missile graphic and acts as a cursor which can be moved around the screen using a joystick in port 1. In the text window at the bottom of the screen is a list of the valid commands used in the program. They are accessed by pressing the first letter of the command only.

There is no facility to save a picture once it has been drawn. The easiest way to do this is to videotape your work using a video recorder and an aerial splitter.

You could try adding a subroutine to save a picture as a file to disc or cassette, but as each screen area occupies about 6k a simple save routine may take some time to execute.



PROGRAM STRUCTURE

40-89	Main program loop. Executes draw commands and moves cursor.
90-190	Send program to various command subroutines.
200-220	Line drawing routine.
399-450	Colour changing routine.
500-520	List valid commands in text window.
1000-1095	Fill routine.
2000-2095	Initialise program. Set up player missile cursor. Put machine code routine starting at address 1536 that handles movement of player missile cursor.

MAIN VARIABLES

HO	Horizontal position of cursor.
YY	Vertical position of cursor.
FL3	Flag to test whether in line mode.
CO	Colour of current playfield.
X,Y	Coordinates of plotting routines.

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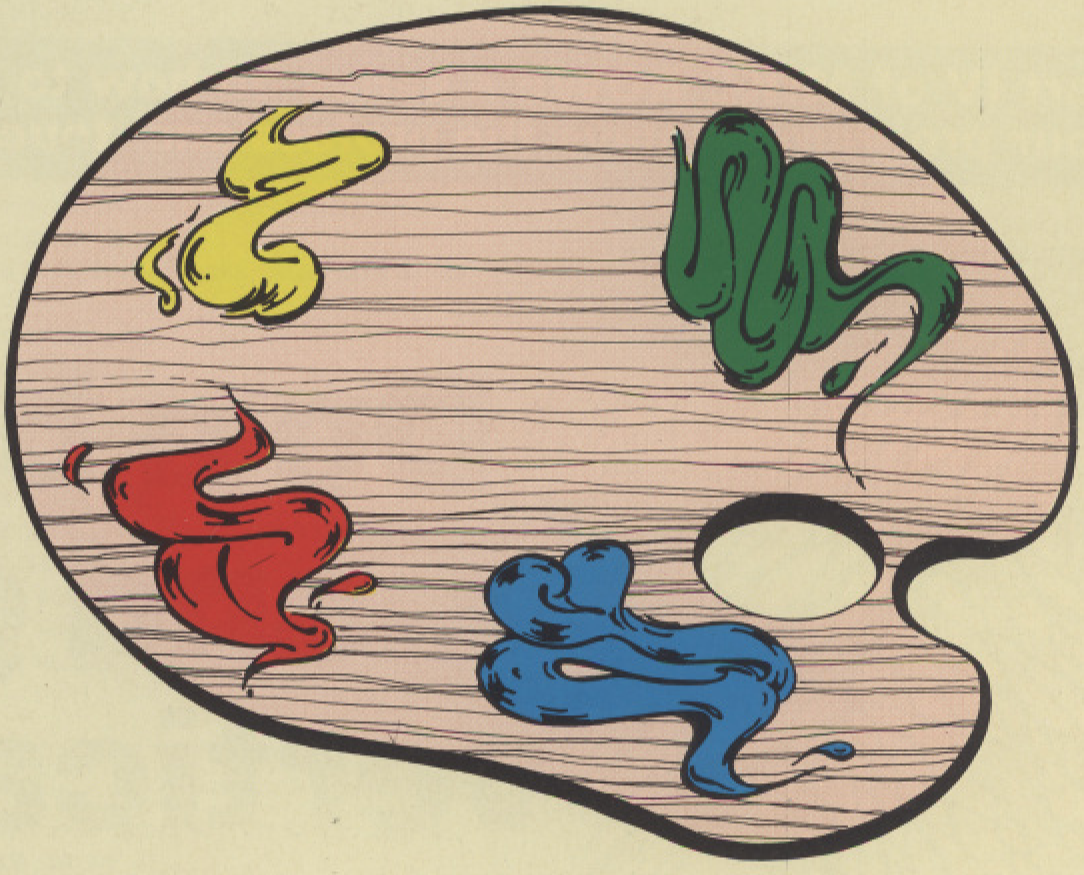
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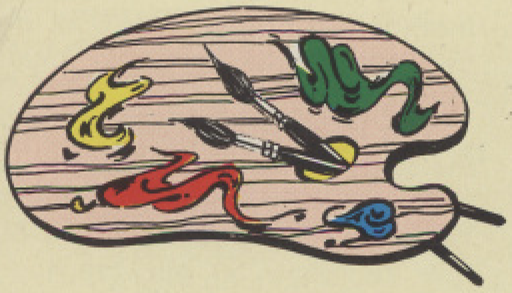
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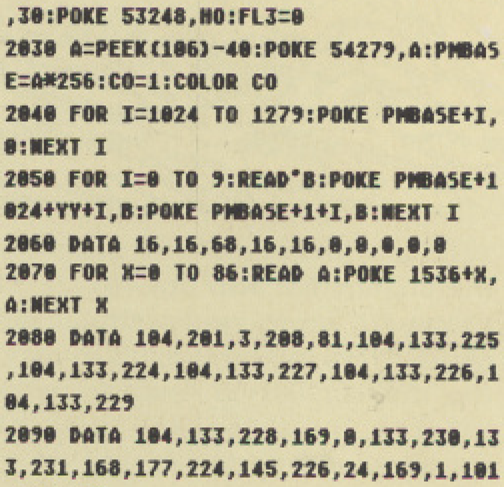
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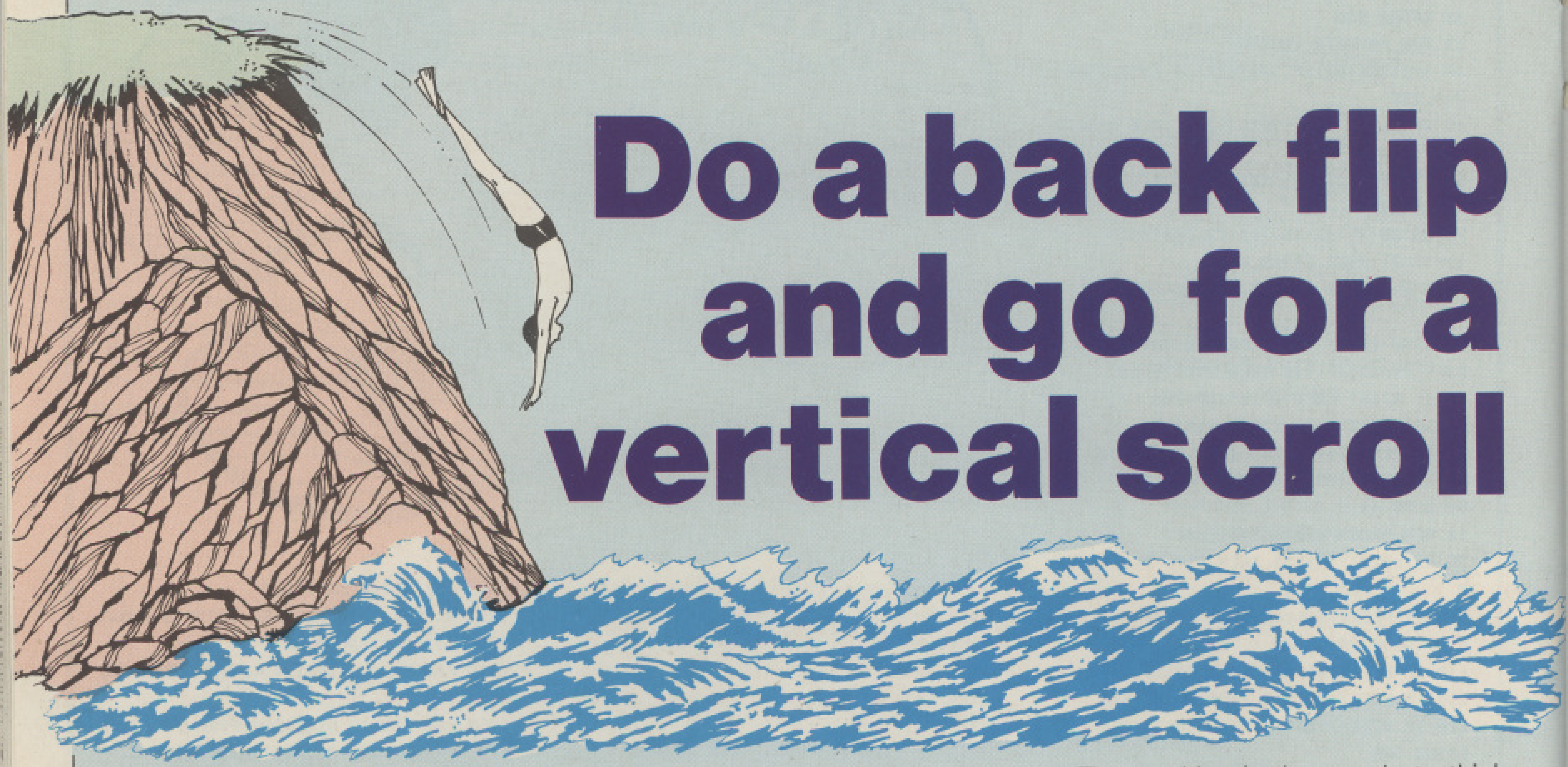
```
10 REM ***COMPUTER CANVAS***
20 REM ***BY STEPHEN WILIAMSON***
30 GOSUB 2000
35 GOSUB 500
39 REM ***MAIN LOOP***
40 S=STICK(0):IF STRIG(0)=0 THEN POKE
764,255
45 IF FL3=1 AND STRIG(0)=0 THEN DRAWTO
 X,Y:FL3=0
60 YY=YY-(S=6)-(S=10)-(S=14)+(S=5)+(S=
9)+(S=13)
70 HO=HO-(S=9)-(S=10)-(S=11)+(S=5)+(S=
6)+(S=7):POKE 53248,HO
80 D=USR(1536,PMBASE,PMBASE+1024+YY,10
)
82 X=HO-45:IF X<0 THEN X=0:HO=45
83 Y=YY-29:IF Y<0 THEN Y=0:YY=29
85 IF X>159 THEN X=159:HO=204
86 IF Y>159 THEN Y=159:YY=188
87 IF PEEK(764)<>255 THEN GOSUB 90
88 IF STICK(0)<>15 THEN POKE 77,0
89 GOTO 40
90 REM **COMMAND ROUTINE**
95 IF PEEK(764)=58 THEN PLOT X,Y:RETUR
N
100 IF PEEK(764)=42 THEN COLOR 0:PLOT
X,Y:COLOR CO
110 IF PEEK(764)=56 THEN GOSUB 1000
115 IF PEEK(764)=18 THEN GOSUB 400
120 IF PEEK(764)=31 THEN CO=1:COLOR 1:
GOSUB 500
```



```
130 IF PEEK(764)=30 THEN CO=2:COLOR 2:
GOSUB 500
140 IF PEEK(764)=26 THEN CO=3:COLOR 3:
GOSUB 500
150 IF PEEK(764)=0 THEN GOSUB 200
190 RETURN
199 REM ***DRAW LINE***
200 IF FL3=0 THEN PLOT X,Y:X1=X:Y1=Y:F
L3=1
210 POKE 764,255:RETURN
220 RETURN
399 REM ***CHANGE COLOUR***
400 POKE 764,255:? "COLOR 0-15";
410 INPUT C
420 SETCOLOR CO-1,C,8
430 ? "BRIGHTNESS 0-14";
440 INPUT B
450 SETCOLOR CO-1,C,B
499 REM **VALID COMMANDS**
500 ? "COLOR DRAW ERASE FILL LINE 1TO
3CHANGE"
515 ? "PLAYFIELD";CO
520 POKE 764,255:RETURN
999 REM ***FILL***
1000 COLOR CO:X=HO-45:Y=YY-29:PLOT X,Y
:POKE 764,255
1010 X1=X:X2=X:X3=X:X4=X:Y1=Y:Y2=Y:Y3=
Y:X5=X+1:XX1=X:XX2=X:E=0:F=0:FL1=0:FL2
=0:F1=0:F2=0
1015 IF F1=1 AND F2=1 THEN RETURN
1017 IF PEEK(764)<>255 THEN RETURN
1020 LOCATE X1-1,Y1,A:IF A<>0 THEN PLO
T X1,Y1:X1=XX1:PLOT X1,Y1
1030 LOCATE X2+1,Y1,B:IF B<>0 THEN PLO
T X2,Y1:X2=XX1:PLOT X2,Y2
1040 LOCATE X3-1,Y2,C:IF C<>0 THEN PLO
T X3,Y2:X3=XX2:PLOT X3,Y2
1050 LOCATE X4+1,Y2,D:IF D<>0 THEN PLO
T X4,Y2:X4=XX2:PLOT X4,Y2
1070 IF C<>0 AND D<>0 AND Y2>0 THEN Y2
=Y2-1:LOCATE X3,Y2-1,E:IF E<>0 THEN FL
2=FL2+1
1072 IF C<>0 AND D<>0 AND FL2>0 THEN F
L2=FL2+1:IF FL2>2 THEN Y2=Y2+1:FL2=2:F
2=1
1075 IF A<>0 AND B<>0 THEN Y1=Y1+1:LOC
ATE X1,Y1+1,F:IF F<>0 THEN FL1=FL1+1
1077 IF A<>0 AND B<>0 AND FL1>0 THEN F
L1=FL1+1:IF FL1>2 THEN Y1=Y1-1:FL1=2:F
1=1
1080 IF A=0 THEN PLOT X1,Y1:X1=X1-1:TR
AP 40
1082 IF B=0 THEN PLOT X2,Y1:X2=X2+1:TR
AP 40
1084 IF C=0 THEN PLOT X3,Y2:X3=X3-1:TR
AP 40
1086 IF D=0 THEN PLOT X4,Y2:X4=X4+1:TR
AP 40
1095 GOTO 1015
2000 REM ***INITIALISATION***
2010 HO=45:GRAPHICS 15:RESTORE :YY=29:
POKE 764,255:SETCOLOR 2,12,4
2020 POKE 53277,3:POKE 559,62:POKE 704
,30:POKE 53248,HO:FL3=0
2030 A=PEEK(106)-40:POKE 54279,A:PMBAS
E=A*256:CO=1:COLOR CO
2040 FOR I=1024 TO 1279:POKE PMBASE+I,
0:NEXT I
2050 FOR I=0 TO 9:READ B:POKE PMBASE+1
024+YY+I,B:POKE PMBASE+1+I,B:NEXT I
2060 DATA 16,16,68,16,16,0,0,0,0,0
2070 FOR X=0 TO 86:READ A:POKE 1536+X,
A:NEXT X
2080 DATA 104,201,3,208,81,104,133,225
,104,133,224,104,133,227,104,133,226,1
04,133,229
2090 DATA 104,133,228,169,0,133,230,13
3,231,168,177,224,145,226,24,169,1,101
,224,133
2100 DATA 224,169,0,101,225,133,225,24
,169,1,101,226,133,226,169,0,101,227,1
33,227
2110 DATA 24,169,1,101,230,133,230,169
,0,101,231,133,231,24,165,228,197,230,
208,206
2120 DATA 165,229,197,231,208,200,96
2130 RETURN
```



Part IV of MIKE ROWE's series on how to give your program displays the professional touch



Do a back flip and go for a vertical scroll

WE have examined the nature of the display list and how to alter it to create more professional displays. Now let's move on to using the display list to create special effects, in this case vertical scrolling and page flipping.

Page flipping is a term used to describe an action directly comparable with turning over the page of a book – instantly switching from one page or screen of information to a different one.

On many computers the screen memory is restricted to a set area of memory and nowhere else. On Atari computers any portion of memory can be used as the screen memory even including the ROM areas. As these cannot be altered this is of little practical use, but illustrates the versatility of the machines.

Thus for many machines to change from one displayed screen to another you would need to erase the screen memory and redraw or reprint the new screen.

On the Atari you can just simply skip to a new area of memory, which is almost instant even by machine code standards. The procedure to accomplish this is unbelievably simple.

You may remember in the first article in the series I described the construction of the display list. I mentioned that the fifth and sixth numbers in the list were the memory location from which the screen display would be taken in the order low byte, high byte.

It follows then that changing these two numbers would, with only two pokes, change the area of memory being displayed, that is page flipping. Program I demonstrates this.

This program skips through three areas of ROM, displaying them on a Graphics 0 screen. The speed is impressive, but the display is practically useless. More useful would be a program skipping through previously created screens.

Program II is a very simple demonstration of this. It creates 10 simple Graphics 2 screens identifying each one differently.

This is done by using a Graphics 2 call from Basic which makes the operating system create a Graphics 2 screen at the top of memory and then the message printed on the screen. The machine is then made to think that the top of memory is 0.5k lower by changing the value in location 106.

This number indicates the top of the available memory in pages – one page in memory terms is 256 bytes. Therefore if you subtract two from this location you get the top of memory lowered by 0.5k. You can then make another graphics call and the screen will be located 0.5k below the previous screen.

This has been repeated 10 times in the example to give 10 Graphics 2 screens. The values for the screen memory for each screen are stored in the variable arrays SCREENLO and SCREENHI and it is a simple matter to repoke these values back into the first display list to give the effect of flipping through the screens 1-10 as in the example.

This can now be seen to be more practical. However it is not greatly faster than redrawing each screen. Where the technique really comes into its own is in the higher resolution graphics modes.

Here it can take several minutes to draw a screen, or to load a screen

```
5 REM PROGRAM 1
10 REM PAGE FLIPPING DEMO 1
100 GRAPHICS 0
110 DL=PEEK(560)+PEEK(561)*256:SCREENL
O=PEEK(DL+4):SCREENHI=PEEK(DL+5):REM F
IND DISPLAY LIST AND SCREEN MEMORY
120 ? "DISPLAY ONE AREA OF ROM."
130 GOSUB 1000
140 POKE DL+5,200:REM CHANGE HIGH BYTE
 OF DISPLAY LIST SCREEN MEMORY POINTER
 TO LOCATION OF ROM
150 GOSUB 1000
160 GRAPHICS 0
170 ? "DISPLAY A DIFFERENT AREA OF ROM
"
180 GOSUB 1000
190 POKE DL+5,220:REM DIFFERENT AREA O
F ROM
195 GOSUB 1000
200 GRAPHICS 0
210 ? "DISPLAY A THIRD AREA OF ROM."
215 GOSUB 1000
220 POKE DL+5,240:REM THIRD AREA OF RO
M
230 GOSUB 1000
240 GRAPHICS 0
250 ? "NOW RAPIDLY SWITCH BETWEEN THE
3      DISPLAYED AREAS.PRESS RESET TO
END"
255 GOSUB 1000
260 POKE DL+5,200:POKE DL+5,220:POKE D
L+5,240:GOTO 260
1000 REM DELAY
1010 FOR I=1 TO 2000:NEXT I
1020 RETURN
```

Program I

```
5 REM PROGRAM 2
10 REM PAGE FLIPPING DEMO 2
100 DIM SCREENLO(10),SCREENHI(10):REM
ARRAYS HOLDING LOW & HIGH BYTES OF SCR
EEN LOCATIONS
200 FOR I=1 TO 10:REM DRAW 10 SCREENS
210 GRAPHICS 2+16:POKE 559,0:REM SWITC
H OFF DISPLAY TO INCREASE PLOTTING SPE
ED
220 DL=PEEK(560)+PEEK(561)*256:REM FIN
D DISPLAY LIST
230 SCREENLO(I)=PEEK(DL+4):SCREENHI(I)
=PEEK(DL+5):REM HOLD LOW & HIGH BYTES
OF SCREEN MEMORY
240 POSITION 1,1:? #6;"SCREEN ";I
250 POSITION 1,I+1:? #6;"page flipping
 demo":REM PRINT DIFFERENT MESSAGE ON
EACH SCREEN
260 POKE 106,PEEK(106)-2:REM LOWER MEM
ORY FOR NEXT SCREEN LOCATION
270 NEXT I
280 POKE 559,34:REM TURN LIGHTS BACK O
N
300 FOR I=1 TO 10
310 POKE DL+4,SCREENLO(I):POKE DL+5,SC
REENHI(I):REM FLIP THROUGH THE SCREENS
 IN TURN
320 GOSUB 1000
330 NEXT I
340 GOTO 300
1000 REM DELAY
1010 FOR J=1 TO 100:NEXT J:RETURN
```

Program II

from data stored on tape or disc and to redraw the screen even in machine code.

Each time a change is made can be very slow and useless for animation. Here page flipping can provide a technique for giving animation to very detailed drawings.

The drawbacks become more pronounced however. First memory limitations. If you use a Graphics 8 screen then five screens have already consumed 40k, not to mention where your program and DOS will go.

In practice two or three screens of Graphics 8 are the limit. The new Atari 130XE could, of course, ease this problem somewhat by switching in and out different blocks of memory for the screens.

A second problem is that the 8k modes have a second set of numbers pointing to screen memory half way down the display list, as explained in previous articles, to avoid screen memory crossing a 4k boundary.

You must remember to calculate the new values for these and also to alter these when flipping.

Thirdly, drawing the screens in Basic is both slow and also memory-hungry, especially if using data statements.

This can be avoided by either loading predrawn screens off tape or disc directly into memory – used extensively in commercial programs – or by having a separate program for drawing the screens which then loads in the second program in which the flipping takes place.

For this reason Program III uses a very simple Graphics 8 picture just to demonstrate the possibilities.

Those who are thinking ahead will perhaps have realised that if you can flip to anywhere in memory why not flip just one screen line. Do it repeatedly and voila – scrolling!

This is shown in Program IV, which scrolls through ROM using 20 byte (one screen line in Graphics 2) page flipping. The scrolling is, however, jerky and quite unprofessional in appearance.

Believe it or not, some software manufacturers released Atari programs commercially with scrolling of this type.

Those who have seen programs with good quality vertical scrolling, such as Caverns of Mars or Firefleet, will know that the Atari can produce superb scrolling.

You will remember from my first article in the July issue of *Atari User* that a 32 added to the display list graphics mode number gives vertical scrolling. However this does not give instant scrolling with that single change – in fact alone it makes no difference.

Also an operating system memory location is involved – decimal 54277 ($D405). In Program V the vertical scroll is enabled in line 3 of a Graphics 1 screen by adding 32 to that line in the display list and then 54277 is altered and there it is – smooth scrolling. But only of one line and only to the height of one character.

If all the graphic mode numbers in the display list are altered by adding 32 to them then all the lines will scroll together. However it is only to a maximum of 16 scan lines – two characters height in Graphics 1.

Now a bit of lateral thinking will provide the full answer. If you combine the two techniques of coarse and fine scrolling you will have true, full screen fine scrolling.

In other words fine scroll all the lines one character (eight lines in Graphics 1) by incrementing 54277 from 0 to 7. Then do a coarse scroll by one character by pointing the display list screen memory one line on and simultaneously poke 54277 back to 0.

Repeat this continuously and you have your scrolling, all in Basic, no machine code in sight. Program VI shows this technique.

But wait a minute – the screen

→

```
5 REM PROGRAM 3
10 REM PAGE FLIPPING DEMO 3
20 DIM SCREENLO(8),SCREENHI(8)
100 REM SCREEN 1
110 GRAPHICS 7+16:COLOR 1
120 X1=36:Y1=36:RDIUS=30:REM X,Y POSIT
IONS AND RADIUS OF BALL
130 GOSUB 1000:REM DRAW BALL
140 D=PEEK(560)+PEEK(561)*256:REM FIND
 DISPLAY LIST
150 SCREENLO(1)=PEEK(D+4):SCREENHI(1)=
PEEK(D+5):REM STORE SCREEN MEMORY LOCA
TION IN ARRAY
160 COLOR 3:PLOT 11,95:DRAWTO 51,95
190 POKE 106,PEEK(106)-16:REM LOWER ME
MORY FOR NEXT SCREEN
200 REM SCREEN 2
210 GRAPHICS 7+16:COLOR 1
220 X1=52:Y1=44:RDIUS=25
230 GOSUB 1000
240 D=PEEK(560)+PEEK(561)*256
250 SCREENLO(2)=PEEK(D+4):SCREENHI(2)=
PEEK(D+5)
260 COLOR 3:PLOT 40,94:DRAWTO 64,94
290 POKE 106,PEEK(106)-16
300 REM SCREEN 3
310 GRAPHICS 7+16:COLOR 1
320 X1=68:Y1=52:RDIUS=20
330 GOSUB 1000
340 D=PEEK(560)+PEEK(561)*256
350 SCREENLO(3)=PEEK(D+4):SCREENHI(3)=
PEEK(D+5)
360 COLOR 3:PLOT 58,93:DRAWTO 78,93
390 POKE 106,PEEK(106)-16
400 REM SCREEN 4
410 GRAPHICS 7+16:COLOR 1
420 X1=84:Y1=60:RDIUS=15
430 GOSUB 1000
440 D=PEEK(560)+PEEK(561)*256
450 SCREENLO(4)=PEEK(D+4):SCREENHI(4)=
PEEK(D+5)
460 COLOR 3:PLOT 77,92:DRAWTO 91,92
490 POKE 106,PEEK(106)-16
500 REM SCREEN 5
510 GRAPHICS 7+16:COLOR 1
520 X1=100:Y1=68:RDIUS=10
530 GOSUB 1000
540 D=PEEK(560)+PEEK(561)*256
550 SCREENLO(5)=PEEK(D+4):SCREENHI(5)=
PEEK(D+5)
560 COLOR 3:PLOT 95,91:DRAWTO 105,91
590 POKE 106,PEEK(106)-16
600 REM SCREEN 6
610 GRAPHICS 7+16:COLOR 1
620 X1=116:Y1=76:RDIUS=5
630 GOSUB 1000
640 D=PEEK(560)+PEEK(561)*256
650 SCREENLO(6)=PEEK(D+4):SCREENHI(6)=
PEEK(D+5)
660 COLOR 3:PLOT 114,90:DRAWTO 118,90
700 REM MAIN FLIPPING ROUTINE
710 FOR I=1 TO 6
720 POKE D+4,SCREENLO(I):POKE D+5,SCRE
```

Program III

flickers or flashes occasionally. Well, if you are a perfectionist – and with a perfect machine shouldn't we be? – it does flash occasionally.

This is because Basic is not instantaneous with its alteration in the values in the display list and in location 54277.

If the screen is in the middle of being drawn when a change is made a flicker occurs or the wrong line is displayed for a split second. Don't despair, there *is* a solution, but it means machine code.

In Program VII the same technique as Program VI is used but instead of Basic poking the changes a small machine code subroutine is used. This does several pokes at once with machine code speed shortening the time lapse between the pokes, thus theoretically decreasing the glitches produced on screen.

As you will see, this is the case, but they still occur. In fact the only way to prevent the flicker completely is to make sure that the changes do not occur part way down as the screen is drawn.

This means doing the dirty work during the vertical blank interrupt (VBI). As briefly explained in my previous articles, this means a short machine code routine which runs each time after the screen has been drawn and before the next starts.

Vertical blanks are a subject deserving of an article of their own, so I will go into no further detail than this at present.

At last you have it. True vertical scrolling as good as any arcade game.

The only snag left is screen memory. Of course you are covering a much bigger area than one screen, so simple Plots and Prints will not really be adequate as such.

You have three real choices as to how to design your screens. Firstly you can use a long string to hold the data. This has the advantage that it relocates itself automatically and thus memory management is taken care of.

The snag is that you may accidentally cross a 4k boundary and cause chaos when the scroll reaches this point.

Another method is to calculate an area of memory you know is free and directly poke (or load off disc or tape) the screen data into that area. This is the method used in Program VI.

Finally, you can use a similar method to the page flipping demo in

```
5 REM PROGRAM 4
10 REM VERTICAL SCROLLING DEMO 1
100 GRAPHICS 1+17
110 DL=PEEK(560)+PEEK(561)*256:REM FIN
D DISPLAY LIST
120 HI=DL+5:LO=DL+4:REM LOW AND HIGH B
YTES OF SCREEN MEMORY LOCATION
200 FOR I=55000 TO 65000 STEP 20:REM U
SE ROM AS SCREEN DATA TO FILL DISPLAY
210 HINEW=INT(I/256):LONEW=I-HINEW*256
:REM CALCULATE NEW HIGH & LOW BYTES
220 POKE HI,HINEW:POKE LO,LONEW:REM PO
KE IN NEW VALUES
230 GOSUB 1000:REM DELAY
240 NEXT I
250 GRAPHICS 0:END
1000 REM DELAY
1010 FOR DELAY=1 TO 50:NEXT DELAY
1020 RETURN
```

Program IV

```
5 REM PROGRAM 5
10 REM VERTICAL SCROLLING DEMO 2
100 GRAPHICS 1+16
110 DL=PEEK(560)+PEEK(561)*256:REM FIN
D DISPLAY LIST
120 POKE DL+7,PEEK(DL+7)+32:REM ENABLE
 VERTICAL SCROLLING ON LINE 3
130 ? #6;" smooth scrolling "
140 FOR I=2 TO 5:? #6;"  SCREEN LINE #
";I:NEXT I
200 FOR I=0 TO 7
210 POKE 54277,I:REM POKE UPWARD SMOOT
H SCROLL INTO SMOOTH SCROLL REGISTER
220 GOSUB 1000
230 NEXT I
240 FOR I=7 TO 0 STEP -1
250 POKE 54277,I:REM SMOOTH SCROLL DOW
N
260 GOSUB 1000
270 NEXT I
280 GOTO 200
1000 REM DELAY
1010 FOR DELAY=1 TO 50:NEXT DELAY
1020 RETURN
```

Program V

```
ENHI(I):REM POINT DISPLAY LIST TO NEXT
 SCREEN
730 GOSUB 2000
740 NEXT I
750 FOR I=6 TO 1 STEP -1:REM AND IN RE
VERSE
760 POKE D+4,SCREENLO(I):POKE D+5,SCRE
ENHI(I)
770 GOSUB 2000
780 NEXT I
790 GOTO 700
1000 REM DRAW CIRCLE
1010 DEG :PLOT X1,Y1+RDIUS
1020 FOR J=0 TO 360 STEP 10
1030 X=X1+SIN(J)*RDIUS
1040 Y=Y1+COS(J)*RDIUS
1050 DRAWTO X,Y
1060 NEXT J
1070 RETURN
2000 REM DELAY
2010 FOR DELAY=1 TO 100:NEXT DELAY
2020 RETURN
```

```
5 REM PROGRAM 6
10 REM VERTICAL SCROLLING DEMO 3
20 DIM A$(4):A$="line"
100 GRAPHICS 1+16
110 DL=PEEK(560)+PEEK(561)*256:REM FIN
D START OF DISPLAY LIST
120 FOR I=6 TO 27:POKE DL+I,32+6:NEXT
I:REM ADD 32 TO DISPLAY LIST MODES TO
ENABLE VERTICAL SCROLLING
130 POKE DL+3,64+6+32
140 START=64*256:FINISH=66*256:REM DEF
INE CLEAR SITE IN MEMORY FOR SCREEN DA
TA
150 STARTHI=64:STARTLO=0:REM HIGH & LO
W BYTE OF SCREEN MEMORY
160 POKE DL+4,STARTLO:POKE DL+5,STARTH
I:REM POINT DISPLAY LIST TO NEW SCREEN
170 FOR I=START TO FINISH STEP 20
175 FOR J=0 TO 19:POKE I+J,0:NEXT J
180 FOR J=1 TO 4:POKE I+J,ASC(A$(J,J))
:NEXT J
185 POKE I+7,33+(I-START)/20
190 NEXT I:REM POKE DATA FOR DISPLAY 0
INTO MEMORY
200 FOR I=0 TO 7
210 POKE 54277,I
220 GOSUB 1000
230 NEXT I:REM FINE SCROLL 1 CHARACTER
UPWARDS
235 REM CALCULATE NEW COARSE SCROLL ME
MORY LOCATION
240 STARTLO=STARTLO+20:IF STARTLO>256
THEN STARTLO=STARTLO-256:STARTHI=START
HI+1:IF STARTHI=66 THEN END
250 POKE DL+4,STARTLO:POKE DL+5,STARTH
I:REM POKE IN COARSE SCROLL
260 GOTO 200:REM BACK TO SET FINE SCRO
LL TO 0 AND RESTART FINE SCROLL
1000 REM DELAY
1010 FOR DELAY=1 TO 30:NEXT DELAY
1020 RETURN
```

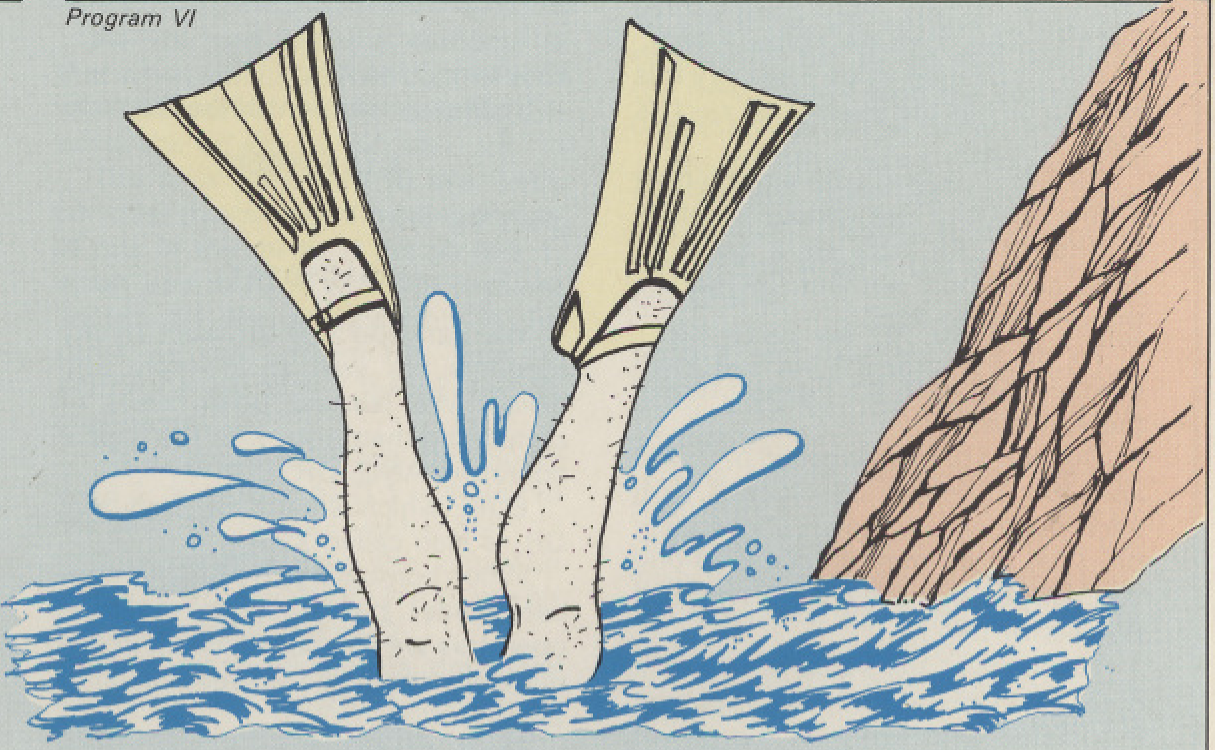
Program VI

Program II – that is, repeated graphics calls after lowering the top of memory pointer.

This is not straightforward and will also involve playing around with the display list memory pointers and locations 88 and 89 to ensure that the screen data is continuous with the previous screen's data, thus avoiding garbage showing up between the screens as you scroll over them.

The advantage is that you can use Plot and Draw from Basic. I recommend the first two methods.

There you have it – your vertical scrolling completed. What? Your favourite games use horizontal or diagonal scrolling? Don't worry, next month I'll show you how to handle this.



There you have it – your vertical scrolling completed

```
5 REM PROGRAM 7
10 REM VERTICAL SCROLLING DEMO 4
20 DIM A$(4):A$="line"
30 FOR I=1536 TO 1560:READ A:POKE I,A:
NEXT I
40 DATA 104,74,170,160,0,104,133,255,1
04,133,254,104,240,4,200,145,254,136,1
04,145,254,202,208,237,96
100 GRAPHICS 1+16
110 DL=PEEK(560)+PEEK(561)*256:REM FIN
D START OF DISPLAY LIST
120 FOR I=6 TO 27:POKE DL+I,32+6:NEXT
I:REM ADD 32 TO DISPLAY LIST MODES TO
ENABLE VERTICAL SCROLLING
130 POKE DL+3,64+6+32
140 START=64*256:FINISH=66*256:REM DEF
INE CLEAR SITE IN MEMORY FOR SCREEN DA
TA
150 STARTHI=64:STARTLO=0:REM HIGH & LO
W BYTE OF SCREEN MEMORY
160 POKE DL+4,STARTLO:POKE DL+5,STARTH
I:REM POINT DISPLAY LIST TO NEW SCREEN
170 FOR I=START TO FINISH STEP 20
175 FOR J=0 TO 19:POKE I+J,0:NEXT J
180 FOR J=1 TO 4:POKE I+J,ASC(A$(J,J))
:NEXT J
185 POKE I+7,33+(I-START)/20
190 NEXT I:REM POKE DATA FOR DISPLAY 0
INTO MEMORY
200 FOR I=0 TO 7
210 POKE 54277,I
220 GOSUB 1000
230 NEXT I:REM FINE SCROLL 1 CHARACTER
UPWARDS
235 REM CALCULATE NEW COARSE SCROLL ME
MORY LOCATION
240 STARTLO=STARTLO+20:IF STARTLO>256
THEN STARTLO=STARTLO-256:STARTHI=START
HI+1:IF STARTHI=66 THEN END
250 A=USR(1536,DL+4,STARTLO,DL+5,START
HI,54277,0)
260 GOTO 200:REM BACK TO SET FINE SCRO
LL TO 0 AND RESTART FINE SCROLL
1000 REM DELAY
1010 FOR DELAY=1 TO 30:NEXT DELAY
1020 RETURN
```

Program VII

The masked bytes are taking control

MIKE BIBBY continues his series on binary numbers

IN this series so far we have learnt a lot about the binary system – the numbers our micro works in.

We have seen that its memory is divided up into bytes – a set of eight two-state, binary units called bits. Each bit can have the value 1 or 0.

If a bit has the value 1 we say it is set. If a bit has the value 0 we say it is clear.

As we're dealing with eight bits at a time, we can use various combinations of the bits in a byte to code any whole number (integer) in the range 0 to 255.

To do this we associate a code number with each bit. Figure I shows the scheme.

Our eight bits are labelled b7 . . . b0 and the numbers associated with each number are shown above each bit. (The more mathematical among you will see that they're in ascending powers of two.)

To discover the value coded in a byte we simply add the numbers associated with every bit that is set (1), ignoring all clear bits (0). So:

%10101000

codes the number:

128 + 32 + 8 = 168

We also learned to do tricks with, or to put it more properly, manipulate, binary numbers. We could create the complement of a number – a sort of binary opposite – by changing every clear bit to set ("setting" the bit) and changing every set bit to clear ("clearing" the bit).

So the complement of the number:

%10101000

gives us:

%01010111

We can add and subtract binary numbers, as well as multiply and divide. We learned other ways of combining them too, with the logical operators AND, OR, EOR.

EOR, which stands for Exclusive OR, is also called XOR.

When combining two binary numbers under the influence of these operators we compare each bit in one number with the corresponding bit of the other.

Then, according to a rule which depends on the operator we're using, we decide whether that particular bit (the result bit) in the "answer" byte is set or clear. Table I shows the rules for the operators.

As we've said, a micro's memory is divided into byte-sized compartments, called memory locations. Each location has a number associated with it so we know which one we're talking about.

These numbers are known as memory addresses.

Much of what a microprocessor does involves moving information – in the form of binary numbers – from one location to another.

If you cast your mind back to earlier articles, I said that each bit was like a switch – its two values 1 and 0 could be used to signify that the switch was on or off respectively.

Imagine that we could wire up one of our bits to a machine's on/off switch. Then by setting that bit we could switch the machine on, and by clearing it we could switch it off.

AND	Sets the result bit only if both bits compared are set, otherwise the result bit is clear.
OR	Sets the result bit if either or both the bits compared are set. Only if both bits compared are clear is the result bit clear.
EOR	Sets the result bit if the bits being compared differ in value. If the EOR bits compared are identical, the result bit is cleared.

Table I: Rules for logical operators

This sort of thing is possible, though we'd need to use some clever electronics. In fact, since we deal with eight bits at a time, we could arrange things so that a single byte controlled the on/off status of eight separate machines – each machine m7,m6 . . . m0 corresponding to an individual bit of that byte, b7,b6 . . . b0. We'll term that byte the control byte.

We call such arrangements memory-mapped output, since what we put in memory maps, or sets the pattern for, what happens in the outside world. Most microprocessors support this or some similar sort of

128	64	32	16	8	4	2	1
b7	b6	b5	b4	b3	b2	b1	b0

Figure I: Values associated with bit positions

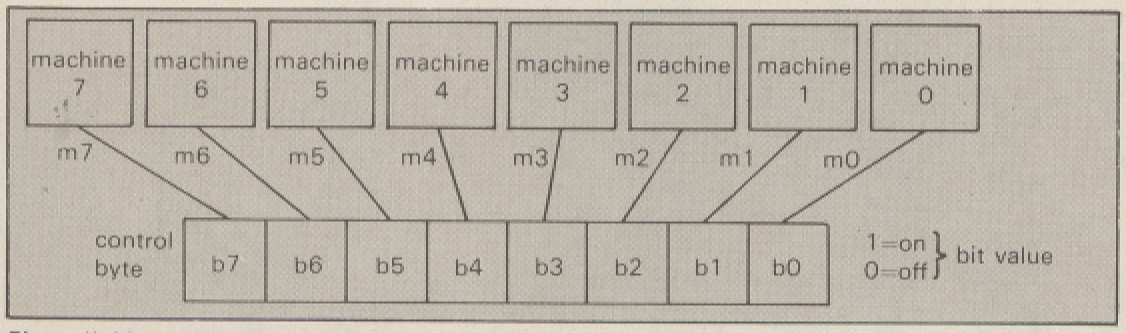


Figure II: Memory mapped control

output. Figure II shows the type of scheme we mean.

Assuming we've got things connected up properly, if we then load the control byte with:

%11111111

all the machines would be on. Remember that if a bit is set the corresponding machine is on. If we want to switch all the machines off, we can load the control byte with:

%00000000

And, of course, we can have any on/off pattern of machines, setting or clearing the relevant bits by loading the control byte with new numbers. Loading it with:

%11110000

is one way of switching off half the machines.

Sometimes, though, we might want to switch a particular machine or two on or off without knowing (or caring) whether the others are on or off.

This means we need some way of affecting only the bits controlling those machines, while leaving the others unchanged.

Suppose we wanted to switch off a machine – say m6. We can do this by making b6 of the control byte zero.

To clear that one bit to zero we AND the control byte with another byte – called the mask – the bits of which are set (1) except for b6, which will be 0. That is, we AND the control byte with:

%10111111

We then make this result our new control byte, and off the machine goes.

To see how it works in practice, let's assume that initially all the machines are on, so the control byte is:

%11111111

To switch machine m6 off we must AND it with:

%1011111

The sum is:

	%11111111	*control byte*
AND	**%10111111**	*mask*
	%10111111	*New control byte*

As you can see, the outcome is that when we update the control byte with the result, m6 is switched off while the others remain on.

The trick isn't hard to see. Let's consider things from the point of view of bits in the mask. If the bit is a 1, when you AND it with the relevant control bit the resulting bit is the same as the control bit. That is, ANDing a bit with 1 leaves that bit unchanged.

Think about it. If the control bit were 1, then as 1 AND 1 = 1, you're left with 1. The bit's unchanged.

If, on the other hand, the control bit were 0 then, as 0 AND 1 = 0, the bit remains unchanged as 0.

In other words bits in the mask with 1 in them leave the corresponding control bit unchanged.

So for machines whose on/off status we don't want to alter – we may not even know if they're on or off – we set the corresponding bit in the mask to 1.

However if the bit in the mask were clear (0) it wouldn't matter what the state of the original control bit was – the result would still be 0.

Say the control bit was 1, then as 1 AND 0 = 0 the resulting bit is a 0.

Alternatively, if it were 0, since 0 AND 0 = 0 the resulting bit is again 0.

So bits in the mask with 0 in them set the corresponding bits in the result byte to 0.

This means to switch specific machines off we construct a mask consisting of 1s for the machines we wish to leave unchanged and 0s for the machines we want off – in the appropriate bit positions.

We then AND the mask with the control byte and then make the resulting byte the new control byte.

Fine, but how do we switch on specific machines?

Well, we update the control byte by ORing it with another mask. This time we put 1 in the bits corresponding to the machine we want on, and 0 in the bits corresponding to the machines whose on/off status we wish to leave unchanged.

This works, since when you OR a bit (whether 0 or 1) with another bit whose value is 1, the answer is 1. That is **0 OR 1 = 1** and **1 OR 1 = 1.**

So using a 1 in the relevant bit of an OR mask will set the corresponding result bit. When this becomes the new control byte the corresponding machine will be turned or left on.

On the other hand, ORing a bit in the control byte (no matter what value) with 0 leaves that bit totally unchanged since **1 OR 0 = 1** and **0 OR 0 = 0.**

So when we OR the bits of the mask that are 0 leave the corresponding bits of the control byte unchanged.

This means, to switch specific machines on we use a mask consisting of 0s for the machines we wish to leave unchanged, and 1s for the machines we want on – in the appropriate bit positions.

We then OR that mask with the control byte and make the resulting byte the new control byte.

Hence, to ensure that m6 is definitely on, we OR the control byte with:

%01000000

For example, if m6 is off, and all the rest on, to switch m6 on we do the following:

	%10111111	*control byte*
AND	**%01000000**	*mask*
	%11111111	*New control byte*

Of course, both AND and OR have uses for the micro enthusiast other than controlling machines.

● *Next month we'll have a look at some, as well as uses of XOR/EOR.*



IF you're fed up knocking a ball around the screen or blasting aliens out of the sky, try the game of Wraptrap, by TIMOTHY HARRINGTON. It will have you tied up in knots.

It's for two players, but if you've been banished to solitary confinement or have only one joystick, the Atari will challenge you. For the single player game, the joystick should be plugged into Port 1.

After the introductory page, choose a one or two-player game and select the speed – keys 1-9. Press START to begin.

Both players start anywhere on the screen moving in any direction. Each player leaves a coloured trail. Use the joystick to move up, down, left or right.

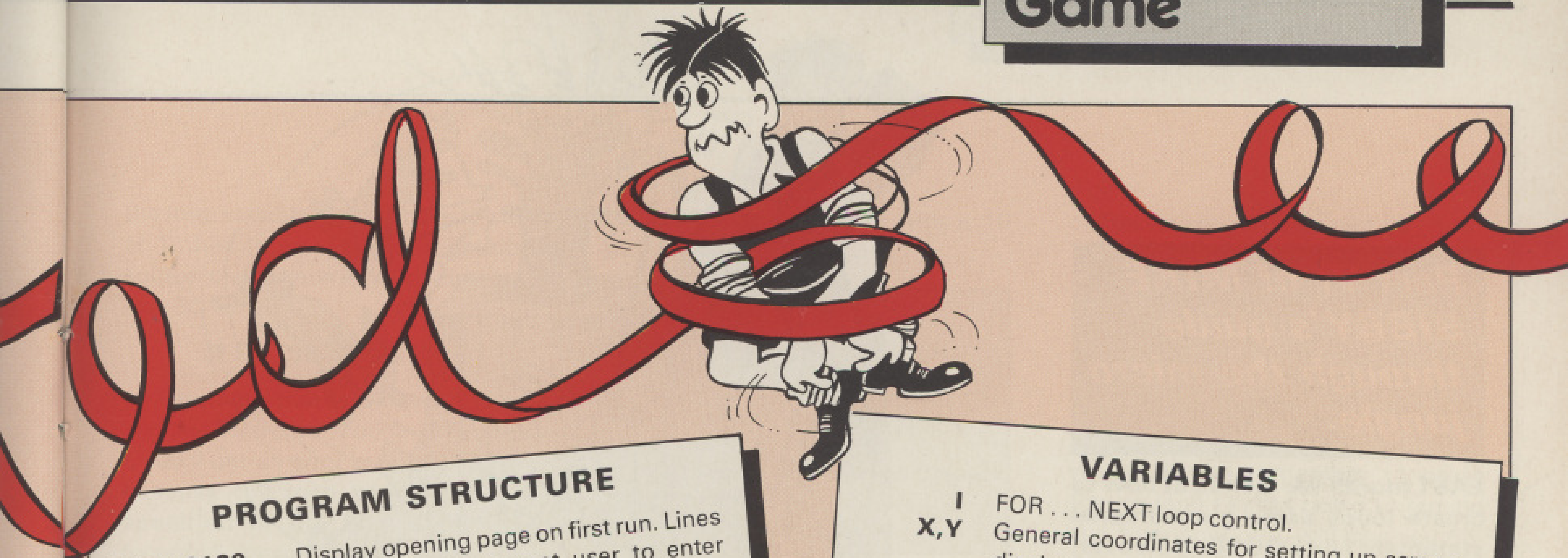
The idea is to trap your opponent among the trails without becoming trapped yourself. To add to the confusion, you must not forget the wraparound screen.

If you crash into your opponent's trail or your own, you will be destroyed. This includes reversing into yourself, so don't try going back along the trail you're leaving.

The program will run without the REM statements and requires less than 13k of RAM.

At the end of the game the scores are displayed. Have fun . . .

```
1000 REM *******************************
1010 REM *\|/... ┌┐┌┐┌┐ ─┬─┌┐┌┐┌┐\|/*
1020 REM *-•-||| ├┤├┤├   | ├┤├┤├-•-*
1030 REM */|\└┴┘ .....    . ..... /|\*
1040 REM *WRAPTRAPGAME  WRAPTRAPGAME*
1050 REM *ATARI AM/XL 400/600/800   *
1060 REM *RAM REQUIRED 16K          *
1070 REM *  Written by              *
1080 REM *Tim Harrington.           *
1090 REM *******************************
2000 GRAPHICS 3:POKE 752,1:COLOR 3:PLO
T 1,1:DRAWTO 38,1:DRAWTO 38,18:DRAWTO
1,18:DRAWTO 1,1:COLOR 1
2010 FOR I=1 TO 66:READ X,Y:FOR J=0 TO
 15:SOUND 0,100-X-I,10,J:PLOT X,Y:NEXT
 J:NEXT I:COLOR 2
2020 FOR I=1 TO 57:READ X,Y:FOR J=15 T
O 0 STEP -1:SOUND 0,20+X+I,10,J:PLOT X
,Y:NEXT J:NEXT I:SOUND 0,0,0,0
2030 PLOT 0,0:DRAWTO 39,0:DRAWTO 39,19
:DRAWTO 0,19:DRAWTO 0,0:SETCOLOR 4,7,4
:POKE 712,2
2040 ? "ONE OR TWO PLAYERS (1or2) ?":P
OKE 764,255
2050 IF PEEK(764)=31 OR PEEK(764)=30 T
HEN P=ABS(PEEK(764)-32):GOTO 2070
2060 GOTO 2050
2070 SETCOLOR 4,2,4:? "%SPEED (1-slow
- 9-fast) ?":CLOSE #1:OPEN #1,4,0,"K:"
:GET #1,S
2080 CLOSE #1:OPEN #1,4,0,"K:":TRAP 20
80:GET #1,S:S=VAL(CHR$(S)):IF S>9 OR S
<1 THEN 2080
2090 SETCOLOR 4,5,4:? "%INSERT JOYSTIC
K(S) INTO PORT #1 AND   (IF TWO PLAYER
S) PORT #2."
2100 ? "Press START to play:":POKE 532
79,0
2110 IF PEEK(53279)<>6 THEN 2110
2120 S=ABS(S-10)*5
3000 GRAPHICS 19:POKE 712,10:X=INT(40*
RND(0)):Y=INT(24*RND(0)):XP=INT(40*RND
(0)):YP=INT(24*RND(0))
3010 COLOR 1:PLOT X,Y:COLOR 3:PLOT XP,
YP:P=(P+3)*1000:TRAP 8000:SI=15:JI=15:
SJ=15:JJ=15:XI=0:XJ=0:W=0
3020 IF RND(0)>0.5 THEN XI=1:YI=0:IF R
ND(0)<0.5 THEN XI=-1
3030 IF XI=0 THEN YI=1:IF RND(0)<0.5 T
HEN YI=-1
3040 IF RND(0)>0.5 THEN XJ=1:YJ=0:IF R
ND(0)<0.5 THEN XJ=-1
3050 IF XJ=0 THEN YJ=1:IF RND(0)<0.5 T
HEN YJ=-1
3060 GOSUB 6000
3070 IF JI<>SI THEN GOSUB 7000
3080 X=X+XI:Y=Y+YI
3090 LOCATE X,Y,Z:IF Z<>0 THEN W=1:GOT
O 9000
3100 FOR I=1 TO S:NEXT I
3110 COLOR 1:PLOT X,Y:COLOR 3:GOTO P
4000 LOCATE XP+XJ,YP+YJ,Z:IF Z=0 THEN
4130
4010 IF XJ<>0 THEN 4080
4020 IF X<XP THEN XJ=-1
4030 IF X>XP THEN XJ=1
4040 IF X=XP THEN XJ=XI:IF XJ=0 THEN X
J=1:IF RND(0)<0.5 THEN XJ=-1
4050 YJ=0:LOCATE XP+XJ,YP,Z:IF Z<>0 TH
EN XJ=XJ*-1:W=5
4060 IF W=5 THEN LOCATE XP+XJ,YP,Z:IF
Z<>0 THEN W=3:GOTO 9000
4070 GOTO 4130
4080 IF Y<YP THEN YJ=-1
4090 IF Y>YP THEN YJ=1
4100 IF Y=YP THEN YJ=YI:IF YJ=0 THEN Y
J=1:IF RND(0)<0.5 THEN YJ=-1
4110 XJ=0:LOCATE XP,YP+YJ,Z:IF Z<>0 TH
EN YJ=YJ*-1:W=5
4120 IF W=5 THEN LOCATE XP,YP+YJ,Z:IF
Z<>0 THEN W=3:GOTO 9000
4130 W=0:XP=XP+XJ:YP=YP+YJ:PLOT XP,YP:
GOTO 3060
5000 GOSUB 6000
5010 IF JJ<>SJ THEN GOSUB 7000
5020 XP=XP+XJ:YP=YP+YJ:LOCATE XP,YP,Z:
IF Z<>0 THEN W=2:GOTO 9000
```



PROGRAM STRUCTURE

2000-2120	Display opening page on first run. Lines 2040 onwards prompt user to enter number of players, speed, and start.
3000-3110	Start players in graphics Mode 3 in random directions. Line 3060 onwards is game in action with test for collision.
4000-4130	Calculate changes in direction. Plot next pixel in the trail. Test for computer's path collision.
5000-5040	Calculate moves for player 2.
6000-6020 (subroutine)	Read joystick port data and control direction.
7000-7080 (subroutine)	Evaluate coordinates for next pixel.
8000-8090	Error-handling routine for wraparound screen.
9000-9120	Collision routine. Sound and colour effects. Display scores.
10000-10007	Opening display page data.

VARIABLES

I	FOR . . . NEXT loop control.
X,Y	General coordinates for setting up screen display.
J	Inner (nested) FOR . . . NEXT loop control.
S	Speed (delay loop) control.
XP, YP	Coordinates of player 2 or computer.
P	Player number – 4000 – 1 player, 5000 – 2 players.
SI, SJ	STICK(0) value for player 1.
JI, JJ	STICK(I) value for player 2.
XI, YI	Store the next coordinate for player 1.
W	Identifies crashed player for scoring.
XJ, YJ	Store next coordinate for player 2 or computer.
Z	Data LOCATEd at the pixel with coordinates X,Y.
ERROR	Stores line number where cursor-out-of-range error occurred.
SCI	Player 1 score.
SC2	Player 2 score.
SC3	Player 3 score.

```
5030 FOR I=1 TO S:NEXT I
5040 PLOT XP,YP:GOTO 3060
6000 SI=STICK(0):IF SI=15 THEN IF SI<7
 THEN IF SI=9 OR SI=10 THEN JI=SI=15
6010 SJ=STICK(1):IF SJ=15 THEN IF SJ<7
 THEN IF SJ=9 OR SJ=10 THEN JJ=SJ=15
6020 RETURN
7000 SI=JI:SJ=JJ:IF STICK(0)=14 THEN Y
I=-1:XI=0
7010 IF STICK(0)=13 THEN YI=1:XI=0
7020 IF STICK(0)=7 THEN XI=1:YI=0
7030 IF STICK(0)=11 THEN XI=-1:YI=0
7040 IF STICK(1)=14 THEN YJ=-1:XJ=0
7050 IF STICK(1)=13 THEN YJ=1:XJ=0
7060 IF STICK(1)=7 THEN XJ=1:YJ=0
7070 IF STICK(1)=11 THEN XJ=-1:YJ=0
7080 RETURN
8000 IF X<1 THEN X=X+40:GOTO 8090
8010 IF X>38 THEN X=X-40
8020 IF Y<1 THEN Y=Y+24:GOTO 8090
8040 IF Y>22 THEN Y=Y-24
8050 IF XP<1 THEN XP=XP+40:GOTO 8090
8060 IF XP>38 THEN XP=XP-40
8070 IF YP<1 THEN YP=YP+24:GOTO 8090
8080 IF YP>22 THEN YP=YP-24
8090 ERROR=256*PEEK(187)+PEEK(186):TRA
P 8000:GOTO ERROR
9000 FOR I=0 TO 12:POKE 712,I:NEXT I:F
OR I=15 TO 0 STEP -0.2:SOUND 0,40,8,I:
NEXT I
9010 J=-1:FOR I=0 TO 40 STEP 0.2:COLOR
 I:PLOT X,Y:PLOT XP,YP:J=J*SGN(J)+I:SO
UND 0,I+J+60,10,12:NEXT I
9020 SOUND 0,0,0,0:GRAPHICS 1:? #6:? #
6
9030 IF W=1 THEN ? #6;" PLAYER 1 CRASH
ED!":SC3=SC3+1:IF P=5000 THEN SC2=SC2+
1:SC3=SC3-1
9040 IF W=2 THEN ? #6;" PLAYER 2 CRASH
ED!":SC1=SC1+1
9050 IF W=3 THEN ? #6;"ATARI 6502 CRAS
HED!":SC1=SC1+1
9060 ? #6:? #6;"  SCORES:":? #6:? #6;"
  player 1=   ";SC1:? #6:? #6;"  playe
r 2=   ";SC2
9070 ? #6:? #6;"  atari 6502= ";SC3
9080 ? #6:? #6;"  PRESS start FOR":? #
6;"  ANOTHER GAME":POKE 53279,0
9090 IF PEEK(53279)<>6 THEN 9090
9100 GOTO 2040
10000 DATA 9,5,9,6,9,7,9,8,9,9,9,10,10
,11,11,10,11,9,11,8,11,7,11,6,11,5,12,
11,13,10,13,9,13,8,13,7,13,6,13,5
10001 DATA 15,11,15,10,15,9,15,8,15,7,
15,6,15,5,16,5,17,5,18,6,18,7,17,8,16,
8,17,9,17,10,18,10,18,11
10002 DATA 20,11,20,10,20,9,20,8,20,7,
20,6,21,5,22,5,23,6,23,7,23,8,23,9,23,
10,23,11,21,9,22,9
10003 DATA 25,11,25,10,25,9,25,8,25,7,
25,6,25,5,26,5,27,5,28,6,28,7,27,8,26,8
10004 DATA 11,8,12,8,13,8,14,8,15,8,13
,9,13,10,13,11,13,12,13,13,13,14
10005 DATA 17,14,17,13,17,12,17,11,17,
10,17,9,17,8,18,8,19,8,20,9,20,10,19,1
1,18,11,19,12,19,13,20,13,20,14
10006 DATA 22,14,22,13,22,12,22,11,22,
10,22,9,23,8,24,8,25,9,25,10,25,11,25,
12,25,13,25,14,23,12,24,12
10007 DATA 27,14,27,13,27,12,27,11,27,
10,27,9,27,8,28,8,29,8,30,9,30,10,29,1
1,28,11
```





Part VI of MIKE BIBBY's guide through the micro jungle

And now FOR my NEXT trick...

LAST month we looked at how to create loops using a conditional statement and a GOTO. However, if you just want your micro to do something a fixed number of times, there is another technique you can use, the FOR ... NEXT loop.

If you have a number of lines of a program that you want repeating for a definite number of times you mark them out by putting the FOR statement at the beginning and the NEXT statement at the end of those lines.

When the micro reaches a FOR it knows it has a loop on its hands. It will repeat the lines (or code, as the professionals say) between the FOR and the NEXT as many times as needed. To do this, the micro needs to use a variable as a counter to keep track of how often the loop has been performed.

In our previous loops we've always used a numeric variable for our counter – *number*. Each time the loop was performed we increased *number* by one until we reached our finishing condition.

In a FOR ... NEXT loop the variable you use for your counter increases automatically on each repetition of the loop. However, you need to tell the micro where to start and where to finish. To see how we do this in practice, let's look at Program I, which prints out HELLO 10 times.

Lines 30 and 50 mark out the lines we want repeating (line 40). Line 30 reads:

```
30 FOR NUMBER = 1 TO 10
```

The FOR indicates the beginning of the loop. This is followed directly by the counter variable, in this case *number*. After the '=' sign the 1 to 10 tells the micro to start *number* at 1 and keep on increasing it by one each time the loop is repeated until it gets past 10.

```
10 REM PROGRAM I
20 PRINT CHR$(125)
30 FOR NUMBER=1 TO 10
40 PRINT "HELLO"
50 NEXT NUMBER
60 PRINT "GOODBYE"
```

Program I

The loop is then finished and the micro carries on with the rest of the program, in this case line 60. The outcome of all this is that HELLO is printed 10 times followed by a final GOODBYE.

The micro's thought processes go like this:

```
NUMBER = 1 PRINT "HELLO"
Increase NUMBER
NUMBER = 2 PRINT "HELLO"
Increase NUMBER
NUMBER = 3 PRINT "HELLO"
```

and so on until:

```
NUMBER = 9 PRINT "HELLO"
Increase NUMBER
NUMBER =10 PRINT "HELLO"
Increase NUMBER
NUMBER =11 But the loop is to 10
so go on to line 60
```

Let's learn some jargon:

- *What we've called the counter variable is, not surprisingly, called the loop variable.*
- *The "limits" of the loop – in this case 1 and 10 – are called the loop parameters.*
- *The lines of the code to be repeated are termed the body of the loop.*
- *When you finish a loop and continue with the rest of the program we say that you have dropped out of the bottom of the loop.*

Notice that we've put the loop variable, *number,* after NEXT in line 60. Some Basics let you leave this out – not so the Atari.

All the above has been a rather long-winded explanation of a simple method of getting the computer to do something a fixed number of times. Try the following versions of line 30, and keep a careful count of the number of HELLOs you obtain. Are they what you expected?

```
30 FOR NUMBER = 1 TO 20
30 FOR NUMBER =10 TO 20
30 FOR NUMBER = 0 TO 20
30 FOR NUMBER =11 TO 20
30 FOR NUMBER = 0 TO 11
```

As will be obvious from the above,

the loop variable doesn't have to start at 1. Just to warn you of a possible source of future errors, try changing line 30 to:

```
30 FOR COUNTER = 0 TO 11
```

Assuming that you haven't changed line 50 from the original Program I, you'll get an error message. This is because the loop variable you've specified in the FOR statement *(counter)* doesn't match the one after the NEXT *(number)*.

Now try Program II.

```
10 REM PROGRAM II
20 PRINT CHR$(125)
30 FOR LOOP=1 TO 10
40 PRINT LOOP
50 NEXT LOOP
```

Program II

If you recall, the loop parameter increases by one each time the loop is repeated. In a burst of wild originality I've called the loop parameter *loop*. The first time through the loop, *loop* is 1, so line 40 prints out the value 1. Then *loop* is increased to 2 since it is the counter, so line 40 prints out 2, and so on.

Once you've worked out what is happening here try adding:

```
60 PRINT LOOP
```

The new line prints out the value of *loop* after the loop has ended. Can you explain the result?

```
10 REM PROGRAM III
20 PRINT CHR$(125)
30 FOR LOOP=1 TO 10
40 PRINT LOOP,LOOP*LOOP,LOOP*LOOP*LOOP
50 NEXT LOOP
```

Program III

Program III prints out the squares and cubes of the numbers up to 10. Rather nice isn't it? Of course, there's no need for you to stop at 10 – try increasing it to 100. That's the good thing about loops – you can get the micro to do a considerable amount with very little coding on your part. Program IV will print out whatever multiplication table you want.

Can you alter line 60 of Program III so that the output starts with a 10 and decreases to 1?

```
10 REM PROGRAM IV
20 PRINT CHR$(125)
30 PRINT
40 PRINT "Which table do you want ?"
50 INPUT NUMBER
60 FOR LOOP=1 TO 12
70 PRINT LOOP;" multiplied by ";NUMBER
;" is ";LOOP*NUMBER
80 NEXT LOOP
```

Program IV

Now try running Program V.

```
10 REM PROGRAM V
20 PRINT CHR$(125)
30 PRINT CHR$(65)
40 PRINT CHR$(66)
50 PRINT CHR$(67)
```

Program V

Even if you don't fully understand what's going on, I bet you can still guess what

```
PRINT CHR$(68)
```

would give you!

CHR$ stands for "Character String" though I always read it as "Chris", so I would pronounce:

```
PRINT CHR$(85)
```

as "print Chris eighty-five". The code number can be stored in a variable, so:

```
NUMBER = 65
PRINT CHR$(NUMBER)
```

will work. You see, every character you can put on the screen has its own code number. The code for A is 65, for B is 66 and so on. CHR$() takes the code and turns it into a character string – that is, a string a single character long.

These numbers have been standardised in a table called, rather grandly, the American Standard Code for Information Interchange. It's known as Ascii – pronounced "Askey" – for short. If, however, like me you can never make head nor tail of tables of information, you'll be glad to know that you can use a Basic word called ASC( ) to tell you the number, or Ascii code, of the character you're interested in.

You just put the letter you want inside the brackets – in quotes of course, as we always do with strings. For example, we ask the micro to print out the code for A with:

```
PRINT ASC("A")
```

which, if you remember to press Return (and I'm not going to remind you from now on!), will give you 65, the code for A. ASC stands for Ascii, so read the example above as "PRINT Askey A".

```
10 REM PROGRAM VI
20 PRINT CHR$(125)
30 DIM STRING$(1)
40 PRINT "A letter ?"
50 INPUT STRING$
60 PRINT "ASCII code for ";STRING$;" i
s ";ASC(STRING$)
70 GOTO 40
```

Program VI

Program VI generates the Ascii code for the character you input. Try inputting a string of more than one character and see what happens. Program VII shows the printable Ascii codes between 32 and 122. There are others, but for the moment we'll ignore them. Notice the loop parameters in line 30.

```
10 REM PROGRAM VII
20 PRINT CHR$(125)
30 FOR LOOP=32 TO 122
40 PRINT CHR$(LOOP);
50 NEXT LOOP
```

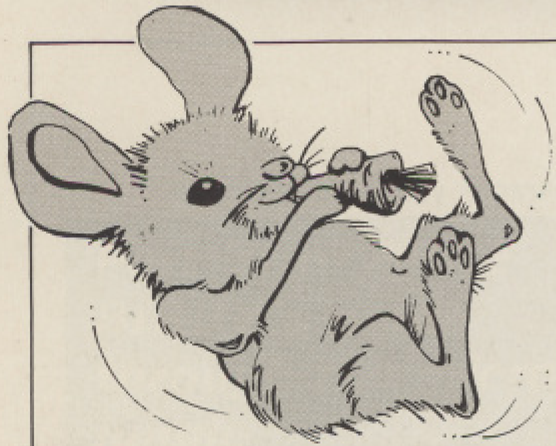
Program VII

Remember, you don't have to start a FOR . . . NEXT loop with the value 1. However, it's sometimes easier to visualise what's going on if the loop does start with 1, or perhaps zero. For instance, Program VIII prints out the whole alphabet in capitals!

```
10 REM PROGRAM VIII
20 PRINT CHR$(125)
30 FOR LOOP=65 TO 90
40 PRINT CHR$(LOOP);
50 NEXT LOOP
```

Program VIII

→



However, I prefer Program IX, which performs the same task.

```
10 REM PROGRAM IX
20 PRINT CHR$(125)
30 OFFSET=64
40 FOR LOOP=1 TO 26
50 PRINT CHR$(OFFSET+LOOP);
60 NEXT LOOP
```

Program IX

What happens is that, since *offset* is 64 throughout the loop, line 50 prints out the CHR$ of *loop* plus 64. For example,

for loop =1, CHR$(65) is printed;
for loop =2, CHR$(66) is printed

and so on.

I admit there's a a bit of mathematical jiggery-pokery involved, but when I'm dealing with the alphabet the numbers 1 to 26 mean far more to me than 65 to 90.

Granted there's one more line than in Program VIII, but it is far easier to alter the program if, say, I happen to get my figures wrong. To demonstrate this, change line 30 to:

```
30 OFFSET = 96
```

Hey presto, lower case! The codes for the lower case alphabet lie from 97 to 122. Try altering Program VIII to print out in lower case, and you'll see it involves much more work.

Of course you could have had *offset* =65 and *loop* from 0 to 25, but that doesn't mean as much to me – I always think of the alphabet in terms of 26! While we're on the subject of offsets, let's have a look at Program X. This prints the numbers from 10 down to 1 rather than from 1 to 10.

```
10 REM PROGRAM X
20 PRINT CHR$(125)
30 FOR LOOP=1 TO 10
40 PRINT 11-LOOP
50 NEXT LOOP
```

Program X

What happens is that instead of just printing out the loop variable line 30 subtracts it from 11 first. So:

when loop =1, 10 is printed (11-1)
when loop =2, 9 is printed (11-2)

and so on until:

when loop =10, 1 is printed (11-10).

Here we are using 11 as a sort of offset.

Try using this idea of taking the loop variable from a number to alter Programs VIII and IX to print the alphabet in reverse, Z to A. Before we leave Program X, I must make the point that I would normally write line 40 as:

```
40 PRINT (11 - LOOP)
```

The brackets do not affect the outcome. They're used here simply as a "container" for the mathematics. I prefer this tidier approach, even if it's not strictly necessary.

Sometimes, however, the use of brackets is vital. For instance:

```
PRINT (8 - 2) * 3
```

and

```
PRINT 8 - (2*3)
```

give totally different results. What happens is that the micro performs the sums inside the brackets first, then does the rest.

So in the first example the micro says to itself *8 minus 2 is 6, multiplied by 3 gives 18,* whereas in the second it says *2 multiplied by 3 is 6, subtracted from 8 leaves 2.* So my amended line 40 tells the computer to do the sum first, then print the answer. As I've said, in this case it's not strictly necessary, but such good habits may prevent you inadvertently dropping into error later.

```
10 REM PROGRAM XI
20 PRINT CHR$(125)
30 FOR LOOP=0 TO 10 STEP 2
40 PRINT LOOP
50 NEXT LOOP
```

Program XI

Have a look at Program XI. This prints out the numbers 0, 2, 4, 6, 8, 10. That is, we go from 0 to 10 in steps of 2. Line 30 holds the secret. You see, we've assumed that in FOR . . . NEXT loops the loop variable – we've always used *loop* – increases, or steps up by one, each time through the loop.

Actually we can tell the computer how much is added each time by tagging STEP onto the end of our previous FOR line. In line 30 we have specified a STEP of 2, so 2 is added to the value of the loop variable each time. Change line 30 to:

```
30 FOR LOOP = 1 TO 10 STEP 2
```

and you get 1, 3, 5, 7 and 9 printed out.

Notice that 10 is never printed – this is because when *loop* is 9 and you come to NEXT *loop,* you increase it by 2, obtaining 11. This is outside the loop parameters, so you drop through the bottom of the loop – that is, the loop ends. You can actually use the idea of STEP to *decrease* the loop variable – you just use a negative STEP.

Program XII uses this technique to print out the numbers 10 down to 1, far more simply than in Program XI.

```
10 REM PROGRAM XII
20 PRINT CHR$(125)
30 FOR LOOP=10 TO 1 STEP -1
40 PRINT LOOP
50 NEXT LOOP
```

Program XII

Notice that the loop parameters now go from 10 to 1. The larger number comes first, since we are decreasing the parameters each time. Adding –1 is equivalent to taking 1 away. You don't even have to increase STEP by whole numbers. To prove it, try changing line 30 of Program XII to:

```
30 FOR LOOP = 1 TO 10 STEP 0.5
```

Can you see what's happening?

● *Now that we've covered the fundamentals of loops we'll continue next month by using them in a variety of ways.*



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THIS month *Atari User* is giving away a super bundle containing the recently launched Atari 130XE personal computer and a 1050 disc drive plus a box of blank discs – all by courtesy of Compumart, the newly formed and rapidly expanding Atari mail order company based in the Midlands.

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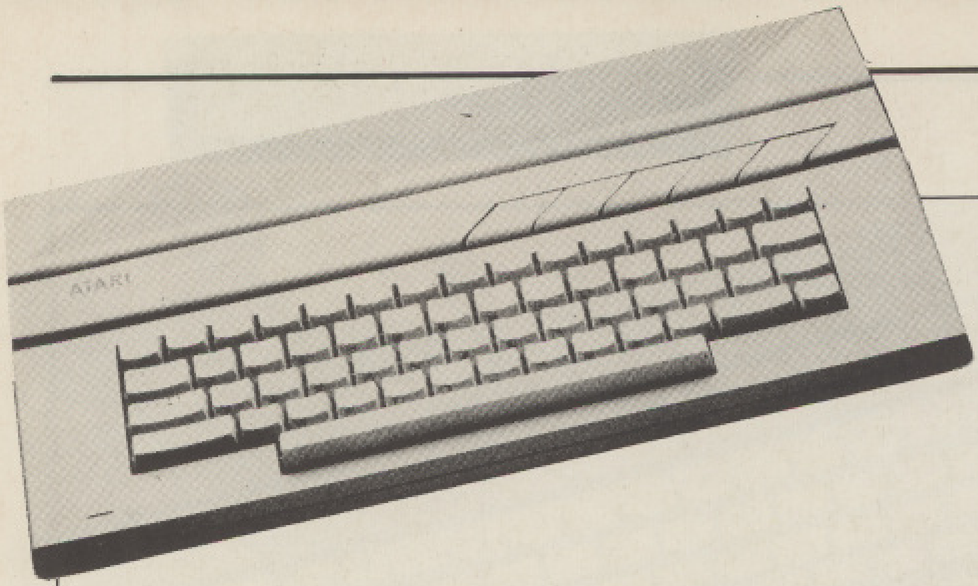
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Post to: Atari 130XE Contest, Atari User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. To arrive not later than October 31, 1985.



How to use that extra 64k

MICHAEL KING presents a simple way to take the strain out of disc filing

IF you happen to be one of the fortunate ones who has been forced by a wife who wants to keep you quiet into buying the new Atari 130XE then you may know that a new DOS is available which allows us to use the extra 64k of RAM as a RAM-disc.

Yes, it's true, good old DOS 2.0 has been upgraded to DOS 2.5 for the 130. "What's the .5 for?" I hear you ask.

Well, the DOS 2.0 screen format and functions have been kept almost the same, but this version comes with an extra file called RAMDISK.COM.

When you boot the disc DOS 2.5 looks for and loads this file before it looks for the AUTORUN.SYS file.

When the boot process has finished and control has been passed to Basic, assembler or to your application program, you have at your disposal an extra "disc drive" accessed with the device name D8:filename.ext.

Good, eh! Instead of saving your program to the disc every 10 minutes (just in case you crash) you are able to save a copy to the extra area of RAM.

This D8 drive can be used exactly as a normal drive, loading, saving and even opening a file to get or put bytes from or to.

During the process of programming with most assemblers, for example, you often have a need to "INCLUDE" a number of disc files within the code at assembly time. How about, instead of having these files on a disc, have them in RAM and call them by changing the code to .INCLUDE #D8:file . . .

Think about it. All the simplicity of including library files with the speed of a machine code byte transfer routine. Let me tell you, it speeds up the assembly stage no end – and keeps that disc from spinning, too.

Let me explain what this little program does. Type in the Basic listing exactly as shown. After saving it (please), type RUN.

The program will check your typing and if you just happen to have made a few mistakes in the data you have entered the appropriate message will be printed and the offending line will be listed for alteration.

Insert a DOS 2.5 disc with RAMDISK.COM into drive 1 when asked to, and press Return. An AUTORUN.SYS file will be written to the disc.

Now that has been done, let me tell you how to use the program.

If you have a number of files on disc that you regularly use – utilities, listed subroutines or your INCLUDE files for example – how nice it would be if they were already on the RAM-disc after the boot process has done its bit. Well it saves copying them over one at a time, doesn't it?

All you have to do is rename all the files you wish to be transferred to drive 8 with the extender .D8. Quite easy to remember isn't it?

Now when you boot up using this disc – it must have RAMDISK.COM on of course – all of your files will be moved into RAM just waiting to be used.

```
1 REM      D8 FILE TRANSFER PROGRAM
2 REM        by Michael (plod) King
3 REM
4 REM
10 GRAPHICS 0:POKE 752,1:POKE 710,146:
PASS=1:? "       D8 FILE TRANSFER PROGR
AM"
20 CHK=0:RESTORE :IF PASS=1 THEN POSIT
ION 12,10:? "CHECKING LINE":GOTO 40
30 POSITION 12,10:? "WRITING LINE "
40 FOR LINE=1000 TO 1440 STEP 10
50 POSITION 16,12:? LINE
70 FOR BYTE=1 TO 10
80 READ NUM
90 CHK=CHK+NUM
100 IF CHK>999 THEN CHK=CHK-1000
110 IF PASS=2 THEN PUT #1,NUM
120 NEXT BYTE
130 READ CHECK
140 IF CHECK<>CHK THEN ? "ERROR IN DAT
A":POKE 752,0:LIST LINE:END
150 NEXT LINE
160 IF PASS=2 THEN ? :? "AUTORUN.SYS C
OMPLETE":END
170 ? :? "INSERT DESTINATION DISK AND
HIT A KEY";:POKE 764,255
180 ON PEEK(764)=255 GOTO 180:? CHR$(1
56)
190 PASS=2:OPEN #1,8,0,"D:AUTORUN.SYS"
200 GOTO 20
210 REM
220 REM
1000 DATA 255,255,0,32,251,32,169,12,1
57,66,229
1010 DATA 3,76,86,228,157,74,3,169,0,1
57,182
1020 DATA 75,3,169,3,157,66,3,76,86,22
8,48
1030 DATA 24,165,212,105,12,133,212,16
5,213,105,394
1040 DATA 0,133,213,96,169,177,133,212
,169,33,729
1050 DATA 133,213,96,68,49,58,42,46,68
,56,558
1060 DATA 155,32,32,32,32,32,32,32,32,
32,1
1070 DATA 32,32,68,49,58,177,178,179,1
80,181,135
1080 DATA 182,183,184,174,196,184,32,1
25,84,114,593
1090 DATA 97,110,115,102,101,114,105,1
10,103,32,582
1100 DATA 102,105,108,101,115,32,116,1
11,32,82,486
1110 DATA 65,77,32,68,73,83,75,32,58,4
5,94
1120 DATA 155,155,0,0,238,240,2,162,0,
169,215
1130 DATA 32,141,69,3,169,81,141,68,3,
169,91
1140 DATA 11,141,66,3,169,35,141,72,3,
169,901
1150 DATA 0,141,73,3,32,86,228,162,16,
32,674
1160 DATA 0,32,162,16,169,32,157,69,3,
```

```
169,483
1170 DATA 47,157,68,3,169,6,32,8,32,32
,37
1180 DATA 38,32,162,16,169,5,157,66,3,
169,854
1190 DATA 0,157,73,3,169,11,157,72,3,1
65,664
1200 DATA 212,157,68,3,165,213,157,69,
3,32,743
1210 DATA 86,228,160,1,177,212,201,32,
208,6,54
1220 DATA 32,24,32,76,176,32,32,38,32,
169,697
1230 DATA 49,141,67,32,160,2,177,212,1
53,67,757
1240 DATA 32,200,192,11,208,246,160,3,
185,66,60
1250 DATA 32,201,32,240,8,200,192,11,2
52,32,260
1260 DATA 176,33,240,3,76,242,32,169,4
6,153,430
1270 DATA 66,32,169,68,153,67,32,169,5
6,153,395
1280 DATA 68,32,169,155,153,69,32,162,
16,32,283
1290 DATA 0,32,162,16,169,66,157,68,3,
169,125
1300 DATA 32,157,69,3,169,4,32,8,32,48
,679
1310 DATA 3,76,52,33,206,240,2,96,162,
0,549
1320 DATA 169,9,157,66,3,169,55,157,68
,3,405
1330 DATA 169,32,157,69,3,169,50,157,7
2,3,286
1340 DATA 32,86,228,162,16,169,161,157
,68,3,368
1350 DATA 169,34,157,69,3,169,7,157,66
,3,202
1360 DATA 169,254,157,73,3,32,86,228,1
65,40,409
1370 DATA 141,116,32,165,41,141,117,32
,169,56,419
1380 DATA 141,67,32,162,16,32,0,32,162
,16,79
1390 DATA 169,66,157,68,3,169,32,157,6
9,3,972
1400 DATA 169,8,32,8,32,162,16,169,11,
157,736
1410 DATA 66,3,169,161,157,68,3,169,34
,157,723
1420 DATA 69,3,173,116,32,157,72,3,173
,117,638
1430 DATA 32,157,73,3,32,86,228,32,24,
32,337
1440 DATA 76,223,32,224,2,225,2,118,32
,0,271
```



Danger is the name of the game

BRILLIG explores the fascinating world of Infocom adventures

OVER the last few months I have endeavoured to give as broad a perspective as possible on the various types of adventures available, as well as try to give an idea of some of the problems associated with this type of game.

In doing this some recurring names have been Scott Adams (Adventure International), Level 9 and Infocom. To date the first two have predominated for two principal reasons.

Firstly they supply entertaining adventures which tend to be both well written and of varying degrees of difficulty. Secondly they are among the most affordable of adventures, being cassette-based, thus giving them a wider audience.

Infocom stands alone from other adventure producers, and as such deserves to be considered separately. In truth comparisons are not easy, although they can be made with the other adventures, but I think to be fair Infocom adventures are the standard to which many aspire, but few achieve.

Infocom are relatively expensive disc based text-only adventures – always have been, and hopefully always will be. One of their advertisements showed a picture of a human brain with the caption "The most powerful graphics computer known to man" or words to that effect.

No blocky pictures of woods and a cottage for Infocom. You are plunged into the most detailed and exact prose available to adventures. Screens upon screens of text are revealed as you explore the carefully charted worlds which they bring you.

The drawback is that unless you have a disc drive Infocom games are not for you. Brillig says that this should inspire you to go out and buy your disc drive now!

As stated, Infocom adventures are not cheap. However at least the package shows some care and imagination, rather than a video case with a printed instruction sheet and the game cassette.

Hitch-Hikers Guide to the Galaxy, for example includes a microscopic space fleet and peril-sensitive sunglasses for the player's use in moments of extreme danger – the glasses have opaque black lenses.

This should be standard issue in any Infocom game, where danger is the name of the game – be it from arrest for a murder that only you know you didn't commit, to being disciplined in Planetfall for failing to swab the decks correctly shortly before the spaceship explodes.

Variety is the essence of the range. Consider the Zork Trilogy, so staggeringly popular that they have gone the opposite route to most software and had book versions made from them.

Zork charts a huge underground dungeon in three stages and, while bearing some similarities to Colossal Adventure, shows far more imagination in scene setting.

Part of the reason for this, although by no means all, is the use of disc storage, which allows your Atari to pull off new data all the time as you progress, whereas the majority of other games, being cassette based, do not have that advantage.

It is, however, the use to which they put the space available that makes games so special. It is all very well having 7,000 plus locations but if they are all the same it makes for a tedious exploration.

Similarly, there seems to be a school of thought in adventure writing that in order to create atmosphere all that is required is a liberal sprinkling of assorted adjectives and that is it.

Infocom adds atmosphere, not only by what is included, but also by what is omitted.

On the inclusion side it allows Infocom's programmers to develop characters and responses which leave other games characters looking positively flat.

For instance, Sergeant Duffy, not only "slaps you right back" if you should strike him – a temptation most players of Witness succumb to – but also "it hurts too", giving Duffy a strength and depth which has you wincing at his grip on your forearm as he leads you to the station.

Try following Veronica at her mansion party in Deadline to try to catch a glimpse of her real murderer as she goes off to her doom.

You are prevented, not by an abrupt, clearly inserted device such as "Veronica disappears and you cannot see her" but by a clumsy butler in a gorilla suit who entangles you with another guest, drags you to the floor, and then obscures your view long enough to prevent you from following your fated hostess.

In Planetfall the ambassador who passes by in a corridor is not only there for window dressing, he hands you a leaflet extolling the virtues of the products of his home planet.

I cannot recommend Infocom adventures highly enough. While not for the out-and-out beginner, they are the sort of games that any player can enjoy, as much for the things he gets

"Variety is the essence of the range"

→

wrong as for those he gets right, and still have a bundle of laughs on the way.

Time for that inadvertent error now, in our glitch of the month competition. Following my look at mazes in Escape from Pulsar 7, by Brian Howorth, last month, it seems appropriate that this month's logic bomb comes from the same Mysterious Adventures stable in Waxworks.

Simon Ashford, from Kings Norton in Birmingham, points out that once you are submerged underwater having gone through the airlock, then strike a light, the matches still work.

A medium T shirt is on its way to you Simon (the penalty for not including your size) and keep those glitches coming.

Got to keep these adventure writers on their toes.

Lords of Time crops up again, and SAC Gratton from RAF Cottesmere is having trouble with the Mammoth in Time Zone 2.

Well, if you gather up some wood and petrol and put your faith in Level 9's own brand of matches (has anyone tried these underwater yet?) you should not only get rid of a giant-sized problem but also find something left behind that will give you a nice warm feeling.

How to get past the brontosaurus? Remembering that he is vegetarian may get you out of the pit, but you need to reflect on your acquisitions to get past him.

Lastly, to escape the gladiator, some footwear from showing faith in the temple is all you need.

Level 9 is just about to release Red Moon for the Atari at £6.95. In fact by the time you've read this the game should be available, as a few last-minute problems were being ironed out when I spoke to Level 9 the other day.

So far all Brillig has received is a balloon and a poster, but the news from the Level 9 camp is that this will be their first Atari game with graphics.

Given the Atari graphics capability, they had better be pretty good or I should imagine that the protests will be long and loud.

Pete Austin tells me that if the response is good they may well backtrack on the graphics for Atari versions. Level 9 is also expressing an interest in converting games for the ST range if it takes off.

But don't hold your breath. The same was said for the QL, and look what happened when that hit the marketplace.

Not such happy news from Adventure International, who at the time of going to press still could not supply a publication date for Questprobe 3, The Fantastic Four, originally scheduled for July.

Next month I'll take a quick look at Wizard of Akryz and Red Moon if it arrives. Don't forget those glitches!

MicroLink
in association with
TELECOM GOLD

NEWSLETTER

No. 2 October 1985

Speeding the mail

THREE years ago the old-style telegram was replaced by the Telemessage. You dictated it by phone and you were guaranteed next day (usually breakfast time) delivery.

The only snag was the cost – £3.50 for up to 50 words.

Now, thanks to MicroLink, a new chapter starts in the Telemessage story. Any home or business micro user can send a Telemessage from his own keyboard in one simple operation.

And the cost? Just £1.25 for up to 350 words, or £1.95 for guaranteed first-post delivery.

Your recipient receives the message exactly as you typed it in – neatly printed out on a letter-quality printer and delivered in a distinctive yellow and blue envelope.

Businesses are expected to be the biggest users of the MicroLink Telemessage service. With the unreliability of first-class post, the promise of next day delivery is a big plus.

Home users will be attracted by the illustrated cards that are available for such occasions as weddings and birthdays – the modern equivalent of the old Greetings Telegram but far more convenient.

There are 16 cards in all, and they cost an extra 65p.

Telemessages (but unfortunately not the colourful cards) can also be sent to any address in the USA, from Alaska down to Hawaii. And other countries will soon be joining the system.

Meanwhile, for the rest of the world you can use MicroLink to send an international telegram, again at a cheaper rate than using the phone.

TELEMESSAGES CHARGES

	UK		USA	
	MicroLink	Phone	MicroLink	Phone
Telemessage 1 *Delivery following day (guaranteed)*				
Up to 50 words	£1.95	£3.50	£2.95	£5.75
51-100 words		£5.25		£8.25
101-150 words		£7.00		£10.75
151-200 words		£8.75		£13.25
201-250 words		£10.50		£15.75
251-300 words		£12.25		£18.25
301-350 words		£14.00		£20.75
Telemessage 2 *Delivery following day (not guaranteed)* Up to 350 words	£1.25	N/A	N/A	N/A
Multiple Telemessages *Same text sent to more than one address.* First message charged as above. Each additional address	£1.30	£1.30	£2.50	£2.50
Special occasion cards	65p	65p	N/A	N/A
Direct response *A reply paid envelope included with your message*	30p	30p	N/A	N/A

INTERNATIONAL TELEGRAMS CHARGES

	MicroLink	Phone
Flat rate basic charge	£1.75	£2.00
Each chargeable word:		
Eire	23p	23p
Bands 1-4 (including all Western and Eastern Europe and North America)	32p	32p
Band 5	38p	38p
Delivery on ornamental form	60p	60p

- *The maximum length of a Telemessage is 350 words or 35 lines of text which is approximately equivalent to an A4 page of text.*
- *The addressee's name and full postal address is free of charge.*
- *All prices are quoted ex-VAT.*

Keeping in touch

FOUR Manchester lads hoping to follow the same route to stardom as another quartet from Liverpool are planning to use MicroLink to keep them in touch with their home base during their tours of Britain and the continent.

Pop group So What will be armed with a portable micro and acoustic modem as well as guitars and drums when they set off for a round of gigs.

MicroLink's electronic mail service will keep them right up to date with what's happening back at the "office".

Getting bigger!

THE host of new services now becoming available have been made possible by MicroLink being given its own dedicated £500,000 mainframe computer at Telecom Gold.

It now has the capacity to expand considerably, and lots of additional services are presently in the planning stage which will enable MicroLink members to participate in the many exciting developments now taking place in the world of communications.

YOUR chance to join MicroLink – turn to Page 25



FROM PAUL WOAKES
AUTHOR OF ENCOUNTER!
A NEW CLASSIC
YOU CHOOSE
THE ACTION IN
MERCENARY
Mercenary – a unique combination of flight simulation, adventure and arcade fun. You choose the action.
There is complete freedom of movement in a truly three-dimensional vector-graphic environment. Graphics of exceptional speed create a very realistic experience.
You'll never play the same game twice. Random elements attempt to seal your fate. Your interaction is crucial.
Mercenary presents an absorbing challenge that you will accept again and again.
MERCENARY
ESCAPE FROM TARG
Fly above the planet Targ in a variety of craft. Investigate the multitude of structures on the planet surface in your quest for essential supplies. Search the mysterious subterranean complex in pursuit of your fortune.
Become embroiled in the continuing conflict between the Palyars and Mechanoids. Accept their paid assignments or work independently to gain wealth.
You only have one true friend – the ever-reliable Benson, an almost human PC, who guides you in your travels.
Pursue your objective as you will : To succeed you have to escape from Targ.
NOVAGEN
INITIAL RELEASE
FOR COMMODORE 64 ATARI 48K 800 XL 130 HE
CASSETTE £9.95
DISK £12.95
NOVAGEN SOFTWARE LTD: SALES 142 ALCESTER ROAD BIRMINGHAM B13 8HS

Trying to program without a tape

I AM glad to find at last an Atari magazine in the local shops.

It has taught my family more than what we thought the computer could do.

We bought the Atari 800XL last Christmas and we were most upset when we saw it on sale with the recorder for the same price.

We do not own a recorder yet as they are so expensive on their own.

The problem we are facing at the moment with the programs in your magazine is that our computer will not take them.

We have a lot of errors when we finish the program, yet we reprint the errors that they show at the end of the program when we type RUN and press Return.

We reprint the lines that show as errors and the computer takes them but the program will not.

Also if we are lucky enough to print the program without any errors, like Submarine, it will work for a few minutes them jam.

We have tried pressing Return but nothing happens. The only way we can do it is by pressing Reset then typing LIST. When we do this it starts the list then jams halfway through, so we have to do the same thing again.

Sometimes it will not reproduce the list and will not allow you to print anything – not even move the cursor.

When this happens – which is most of the time – we have to switch off and start again.

We have come to the decision that it must be the computer. Could you please let me know if it is, as it is still under guarantee.

Also I would like to see more about errors in your magazine as the book we had with the computer doesn't explain what to do in the way we would understand. – **L. Williams, Penbrey, Dyfed.**

● The fault is either in the computer itself – try taking it in for service – or in your typing of POKE statements, etc.

We can't imagine life without a disc drive – without even a cassette you have little more than a cartridge games machine, as you are limited to what you can enter in one session.

Please, if you want to get the most from both the computer and the magazine invest in a tape unit – even a second-hand one.

My Logo won't run

I AM very pleased that at last I have found a magazine for the Atari.

I have been reading it each month and I have tried many programs, but in the August issue I could not get any of the Logo programs to run.

I printed: MAKE "WRIGGLE (FD 30 RT 30 FD 30 LT 30 FD 30) and then pressed Return.

I got ERROR – [M] AKE "WRIGGLE etc.

What am I doing wrong? Is it my 600XL that is faulty perhaps? – **Matther Whiting, Maidstone, Kent.**

● It sounds as though you haven't got the Logo cartridge plugged in. Consequently, the Basic interpreter built into your machine is trying to make sense of your input.

It's failing, of course, because it only understands Basic commands, not Logo.

Syntax puzzle

COULD you please let me know if programs printed for the Atari in magazines back in 1983 should be able to be used on a new 800XL Atari which I have just purchased?

I tried a couple of them but I kept getting errors. I checked through the lines but could find none.

One of the errors came up with the No. 17 which the Atari Basic book says is a syntax error. Could you tell me what a syntax error is? – **A. Leadbetter, Letchworth, Herts.**

● Although some early commercial software might not run on your 800XL unless you use a translator-type program, we would expect most magazine listings to work.

Certainly all of our listings will work fine on your machine.

A syntax error occurs when you use a Basic command incorrectly. For example, enter:

```
PRINT CHR$(65
```

and press Return.

The machine will give you an error message because the syntax requires a closing bracket after the number.

A NEXT without FOR

AFTER buying your magazine last Saturday, not to mention the Atari 800XL to go with it, I first read the instructions and then started to key in Frog Jump.

After a couple of hours at the keyboard I was finished, and when I had taken the precaution of putting it on tape I decided that it was time to start enjoying myself.

So I typed RUN and pressed Return. All I've been able to get since is an "error 13 at line 1200" statement.

Now I have checked and re-checked the program against your listing and it all seems to be in order.

So I wonder if you can tell me if it is an error in your listing or a malfunction in my computer?

Now that I have got rid of the bad part, let me say that I can find no fault with your magazine. Indeed it is written in a way that is easy to understand, even by me.

The sections on Graphics and the piece for Beginners – which I surely am – were both enjoyable and informative. – **Mark Disley, Dublin, Ireland.**

● An error 13 means that the machine has encountered a NEXT statement without having previously seen a corresponding FOR statement. Check line 1170 very carefully.

Calling Cornwall

I BOUGHT the July issue of your magazine and was so impressed I placed an order with my newsagent. I also got back issues 1 and 2.

Is there an Atari users group in the Truro area? If so where?

Also, for my stepbrother who also owns an Atari, is there one in the St. Austell area?

When I bought my Atari 800XL in April I had a promise on the Silica Shop order form of an imediate membership in the Atari Owners club, with bulletins and magazines every now and again.

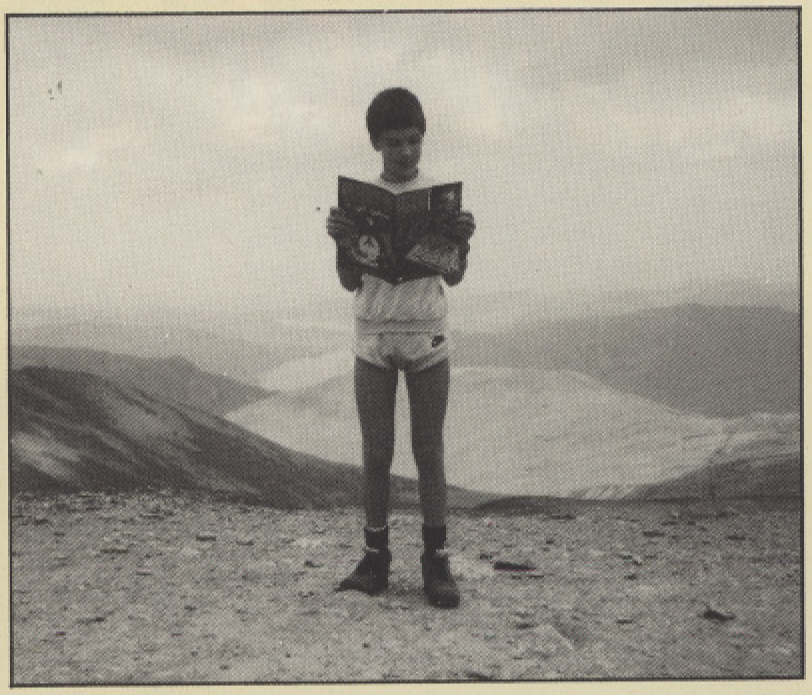
It's now the end of July and since I got my starter pack 2 I've had nothing.

Can you help by informing me as to why this is?

I'm not the only one – my stepbrother has the same problem. – **Michael Dunstan, Truro, Cornwall.**

● We don't know of any groups in Cornwall. If there are any, perhaps someone could let us know.

The Owner's Club Monitor only appears quarterly.



Summit of success

AM I your highest reader? The picture shows me reading your fantastic magazine at 3,116 feet above sea level at the top of Helvellyn in the Lake District. Do I win a prize? – **Phillip Abbott, Bradford.**

● You're holding the prize in the photograph! Before we get a spate of photos like this, we ought to warn readers that anything less than Everest won't be printed!

Start off in hex

HAVING bought the last three issues of your magazine I thought I should put pen to paper to congratulate you on them. At last a decent magazine for Atari owners.

I especially liked the disassembler articles in the July and August issues.

As I cannot yet afford the Assembler/Editor cartridge they both come in very useful.

I thought you might be interested in the modifications I have made. It would be useful to be able to enter the start address in hex as well as denary, which is what the modification listing does.

These modifications allow the user to input a hex start address simply by prefixing it with a "$".

One last modification is to add ",NUM$(6)" to the DIMension statement in line 50.

One last thing. I need to be able to detect when the Break key has been pressed in a program I'm working on. Have you any suggestions on how I can achieve this? – **Geoff Bliss, Chelmsford, Essex.**

● See André Willey's article on Page 28 of the August issue for information on disabling the Break key.

```
130 ? "↓By Kevin Edwards↓↓"
140 ? "↑█"
150 POKE 764,255:? "Enter start locati
on ";
160 INPUT NUM$:IF LEN(NUM$)<1 OR LEN(N
UM$)>5 THEN 140
162 IF NUM$(1,1)="$" THEN 2500
164 TRAP 140:START=VAL(NUM$):IF START<
10^(LEN(NUM$)-1) THEN 140
165 IF START<0 OR START>65535 THEN 140
185 REM ** DELETE THIS LINE **
255 ? :IF PEEK(764)=28 THEN 150
2500 REM *** CONVERT HEX TO DEN ***
2510 NUM$=NUM$(2):N=0
2520 FOR LP=1 TO LEN(NUM$)
2530 IF NUM$(LP,LP)<"0" THEN 2590
2540 IF NUM$(LP,LP)<="9" THEN N=N*16+V
AL(NUM$(LP,LP)):GOTO 2570
2550 IF NUM$(LP,LP)<"A" OR NUM$(LP,LP)
>"F" THEN 2590
2560 N=N*16+ASC(NUM$(LP,LP))-ASC("A")+
10
2570 NEXT LP
2580 START=N:GOTO 165:REM LEGAL HEX NU
MBER ENTERED
2590 POP :GOTO 140:REM ILLEGAL HEX NUM
BER ENTERED
```

Round the clock

HAVING read your article concerning a Defender score I would like to submit my score for the game.

I have clocked the score by exceeding 9,900,000 when the score returns to zero and stays at Level 99.

The game lasted for two days whereupon I finished with numerous men.

I would also like to know if there are any user groups in the Merseyside area or as far as Chester.

I am writing to enquire whether your offer on your published magazine listings will ever be available on cassette as well as disc. I have spent many hours typing in listings which have failed to work through typing errors or bad listings.

Having listings on cassette would be extremely welcome because like most others I do not own a disc drive. – **Peter Barry, Birkenhead.**

● The Liverpool Atari User Group can be contacted c/o Mr Teater, 19 Graffington Crescent, Liverpool L25 9RU.

There is also a Merseyside club c/o Mr R. Gibson, 3 Dunning Close, Upton, Wirral, Merseyside L49 2RH.

Many people have written requesting a monthly tape. This is now available. See the order form on Page 61.

The right connections

I OWN an Atari 800 and need the following information – details of the right cartridge socket connections and details of the cassette socket connections.

I wonder if you, or any of your readers can help?

I have tried writing to Atari but despite enclosing a SAE received no reply.

It's nice to see your magazine on the market, it fills a need. I have found the first two issues very interesting and the adverts have been most useful.

I knew hardware and software were available but never knew where to go before.

It would be great if you could devote at least some space to do-it-yourself add-ons for the Atari as it is such as versatile machine as far as input/output is concerned.

I am convinced it would rival the BBC Micro for serious uses if only details of the connections were available as freely. – **Stephen Fareman, Reading, Berks.**

● You need to get a copy of the "Technical User Notes for the 400/800" from Atari, at a cost of about £17.

They give all details of I/O ports and full circuit diagrams plus software details and the full operating system listing.

Yellow peril screen

I HAVE programmed the enclosed example listing into my computer and saved it on to cassette.

It worked wonderfully, till suddently a yellow screen appeared, with a white line through the middle.

Shortly afterwards an Error message appeared on the screen, – "Error 141 on line 930".

I have tried various ways to get the program to run past line 930.

But I am defeated. Could you therefore let me know what it is that is stopping the program at line 930?

I suspect that one incorrect statement has been put in.

All my efforts proved one thing – that it is the last part of the line which is stopping the program from running further. – **F.J. Windle, Dukinfield, Cheshire.**

● At least two of the example lines you included with your letter had a "+" in place of a "," which obviously affects the program's operation.

Once you've corrected

these errors that you've introduced the program should work fine.

The future of 16k games?

I OWN a 600XL with 16k memory.

Usually when I go in a shop to get a game 95 per cent of them are more than 16k.

I will have to wait a long time before I get a memory expansion.

Do you think any of the games like Dropzone, Beach Head or Bruce Lee will reduce in memory and come down to 16k?

I hope the makers of these games will think about it. – **Christopher Finn, Borehamwood, Herts.**

● As games get more and more sophisticated, it gets less likely that they'll be crammed into 16k.

If it's games you want, our advice would be to upgrade to a bigger machine.

Incidentally, Drop Zone only requires a 48k machine – US Gold labelled the tape insert incorrectly.

Missing symbols . . .

AS a dedicated Atari user, I was very pleased to see that a magazine has been produced solely for the Atari computer – unlike some others which, although fully explained, carry one Atari listing at most.

However, upon reviewing the August issue I am very distressed to find the listings provided by yourselves to be of bad quality, for example, Fruiti Gambler.

Having tried to input the listing I came across many obstacles which, with regret, I could not overcome.

The main problem is that the graphic symbols used could not be found. I own an Atari 800XL.

I would be very grateful if you could explain at the top of your listings the method for obtaining such symbols as it would make life much simpler for the person trying to input such a program.

Also I would like to point out that I have noticed at the bottom of each listing an advertisement to encourage people to purchase the whole magazine on disc.

I assume this is to save people like myself the aggravation of debugging the programs caused by incorrect interpretation and decyphering of the graphic symbols which is so time-consuming and unnecessary if explained properly. – **M. Stinger.**

ATARI USER Mailbag

WE welcome letters from readers – about your experiences using the Atari micros, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

The address to write to is:

Mailbag Editor
Atari User
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY

. . . causing problems

I HAVE just received the August issue of Atari User and was copying out Fruiti Gambler when I got to line 210 and noticed some arrow symbols.

My 800XL does not appear to have these.

Should I have them or can I use something else instead? – **D.A. Cardy, Exeter.**

● Your 800XL does have these characters. It's just that the lousy "manual" supplied with the machine doesn't mention them.

The arrows are obtained using the cursor keys but entering ESC first, so to get ↓ you type ESC CONTROL =

Press and release ESC them press = while holding down the CONTROL key.

The special characters are often the cause of problems, which is why we prefer contributors to use the appropriate CHR$.

We hope to be printing a complete list of how to obtain these characters.

In the meantime, try experimenting with ESC CONTROL (letter) combinations.

Computer camp

AS a result of Tony Dwyer's article in your June issue, not only did I purchase from you the WS2000 modem with Viewterm software, but I am now a trainee at the ITEC which I am enjoying immensely.

The first 'Computer Camp' was held recently and was a great success – all of the children enjoyed themselves very much. I also enjoyed helping Tony and Mike, another student, with the teaching of Logo, which went very well.

There was just one problem that I had when I received my modem and software. That was the Viewterm terminal program, which kept receiving and transmitting garbage. You only need to take a look at the ITEC's Bulletin Board (0268) 522316 to see that I'm not the only one having problems.

However Miracle are apparently working on a new terminal program which will support U/L and D/L on bulletin boards (maybe Xmodem protocols?), and hopefully they will improve the actual terminal part of the program also. – **Sean Morais, Canvey Island, Essex.**

LET there be keywords

IN your Beginner's section Mike Bibby says "variables shouldn't start with Basic keywords, as they confuse the Atari", and cites:

```
10 PRINTER$="EPSON"
```

as an example.

Because of the way Atari Basic is tokenised, it is actually possible to use PRINTER$ as a variable, even though it does contain a keyword, simply by putting LET in front of it.

```
10 LET PRINTER$=
   "EPSON"
```

is a valid Atari Basic line. So is:

```
15 LET PRINT=
   10:PRINT PRINT
```

The only token where this doesn't seem to work is NOT. Try:

```
20 LET NOTE=
   10:PRINT NOTE
```

and see what happens. – **Jack Schofield, Sutton, Surrey.**

● Thanks for setting the record straight, Jack. However we thought LET had gone the way of antimacassars, elephant's foot umbrella stands and the ZX80.

Latest Bulletin

I HAVE seen in past issues of your magazine that you have listed telephone numbers of Atari bulletin boards and I wondered whether you would include mine.

My system is run on an Atari 800, and the bulletin board is called TimeZone. The telephone number is 0244 677978.

It works on a ring-back system, so you have to dial the number and let the phone ring twice, then hang up and call again and the BBS will then answer (300 baud).

The operating times are weekdays 18.30-23.30 and weekends 09.00-23.30. – **Paul Gaulton, Chester.**

Bomb Run for all

CONGRATULATIONS on an excellent magazine which, from what we've seen so far, promises to be a great success.

I am writing about your Bomb Run game from the July issue and although I assume you've already had several letters about it I thought I'd drop you a line anyway.

I keenly typed in the program and ran it on my 48k Atari 800 where it ran without error.

Why am I writing, you might wonder? Because I then swapped this game with my father who had meanwhile been keying in the Disassembler from the same issue, and when he tried it on his 16k Atari 400 he found that it would not run correctly.

After carefully examining the listing, I made the following alterations which will enable the program to work on any Atari model.

You'll probably recognise the character redefinition routine from Dave Russell's excellent article – also in the July issue.

Keep up the good work anyway, and perhaps it might be an idea to ask people to state which Atari machine their programs are written and tested on. – **Peter Appleton, Liverpool.**

```
320 IF P<PE THEN 200
5185 P=PEEK(88)+256*PEEK(89):PE=P+409
5190 POKE P-1,2:POKE P,1
9000 RAMTOP=PEEK(106):POKE 106,RAMTOP-
4
9020 CHBAS=RAMTOP-4:ADDR=CHBAS*256
9060 POKE ADDR+I,PEEK(57344+I)
9160 READ J:POKE ADDR+8+I,J
9300 POKE 756,CHBAS
```

Putting the record straight

THERE are several errors and misconceptions in Bryan Williams' preview of the Atari ST machines in the May issue of Atari User.

The Basic interpreter will not be "a new version of Atari Basic", but Digital Research's Personal Basic, originally developed for the CP/M-86 operating system and supplied to them by Metacomco of Bristol, with presumably, enhancements for graphics support, etc.

Personal Basic was written in BCPL, and therefore will be easy to port on to the ST.

GEM is not an operating system, or "a graphics equivalent of CP/M". It sits on top of TOS, which is really nothing more than CP/M-68k, which is CP/M 2.2 for the 8080/Z80, rewritten in C for the MC68000, so that it is several times the size and isn't any faster.

TOS isn't multi tasking, and won't be for at least a year or so, when DR hope to produce a version of Concurrent CP/M for the MC68000.

A very serious omission on the ST is the apparent lack of a bus expansion connector, which means that there will be very little, if any, third party hardware add-ons produced for it, although it might be possible to use the hard disc interface port for this purpose.

Actually, I think the ST is a very attractive machine, and while too expensive for most home users in this country and Europe, will probably sell well to this market in the States where the average disposable income is much higher. – **L.F. Heller, Newport Pagnell, Bucks.**

Information, please

COULD I have more information on the Atari 800XL 64k personal computer pack because I am thinking of buying one? – **James Rainbow, Powys.**

● We suggest you go to your local dealer and get a full demonstration.

Alternatively, you could write to Atari for their promotional literature, but it's no substitute for a 'hands-on' test.

Smash hit and miss

MY brother and I recently bought an Atari 800XL starter pack with 1010 recorder. We also bought "Atari Smash Hits 3".

When we got home we immediately loaded a game and played it. The problem was that the Pole Position cassette would not load.

Later that evening we discovered that the keyboard was faulty and changed the entire pack.

In the new pack everything worked perfectly except Pole Position. We followed instructions very carefully but it would still not load.

All our other games load so could you please enlighten us?

I am also a keen if not very good programmer and I like to write very basic games.

However the number of games I can write is limited as I have not been able to find a command or routine that will allow me to check a certain screen position to see if there is anything there.

Because of this I can only have one space invader on the screen at a time. – **Matthew Gillie, Dulwich, London.**

● To find the contents of a location on the screen, use:

LOCATE X,Y,A

where X,Y is the position on the screen you want to check, and A is a variable.

After execution, A will contain the colour value for that position, for example in GR.8 that could be 0 for blank or 1 for a dot.

Beware: LOCATE moves your cursor about if you use it on a text screen, and will return the Ascii number of the character at that position.

Pole Position should load with Start and Option pressed on power-up. Then press Play on your recorder and Return.

If it doesn't work send the tape back to Atari for replacement.

GR.eat colours

THANK you for bringing out a magazine for those of us who don't own a Spectrum or Commodore.

I've just started to use GR.11 and have finally figured how to get 15 colours on to the screen at the same time.

However another problem has arisen. How do I print text on to the screen at the same time, as GR.11 doesn't, as far as I know have a text window.

Using GR.11 I found I could use 15 colours in your Etcha-sketch program. You can do this by adding and changing the following lines:

```
150 C=0
120 GRAPHICS 11
130 X=40:Y=80
240 IF STRIG(0)=0 THEN
    C=C+1
245 IF PEEK(53279)=6
    THEN GR.11
285 COLOR C
```

To clear the screen press Start and to change the colours press the fire button.

Also do you think you could do a Top 10 of Atari software, as I would like to know the most popular software for my computer.

Keep up the good work. – **Alan Mulford. Torquay, Devon.**

● No, there isn't a text window with the GTIA modes. The only way to get normal text is by using a "DLI" (Display List Interrupt) routine, written in machine code.

Mike Rowe's series should give you some ideas in this direction.

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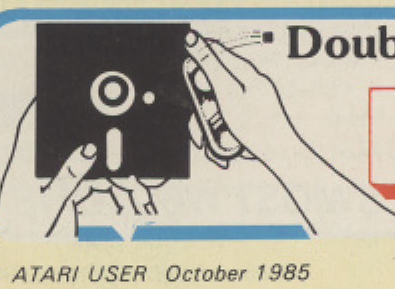
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June issue: In-depth analysis of the 130XE, Submarine, Adventuring, Random numbers, Software reviews, Frog Jump, Microscope, Sounds, Atari Insights – regular series of tutorials: Bit Wise, Beginners and Graphics, special 12 page feature on Communications.

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July issue: Disassembler, Bomb Run, DOS 2.5, 17 Commandments, Adventuring, Display List Tutorial, Software reviews, Power Functions, Treasure Hunt, Keyboard Sounds, Microscope, Insights – Regular series of tutorials: Bit Wise, Beginners and Graphics.

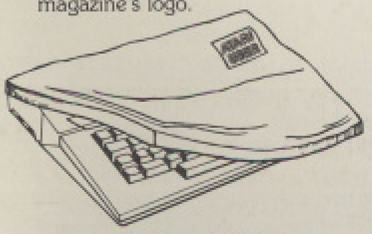
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August issue: In-depth analysis of the 520ST, program protection routines, Fruiti Gambler, Assembler, Touch Tablet programs, first look at Logo, Raider 1997, Dos 2.5 upgrade offer, Display List Tutorial, Microscope, Software reviews, Insights – regular series of tutorials: Bit Wise, Beginners and Graphics.

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September issue: 8-page special on the 520ST, Mode 8 screen dump routine, Maze Munch, Data Maker, Display List Tutorial, 68000 addressing modes, list processing with Logo, Software reviews, Insights – regular series of tutorials: Bit Wise, Beginners and Graphics.

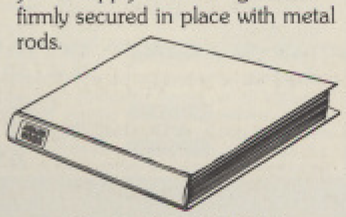
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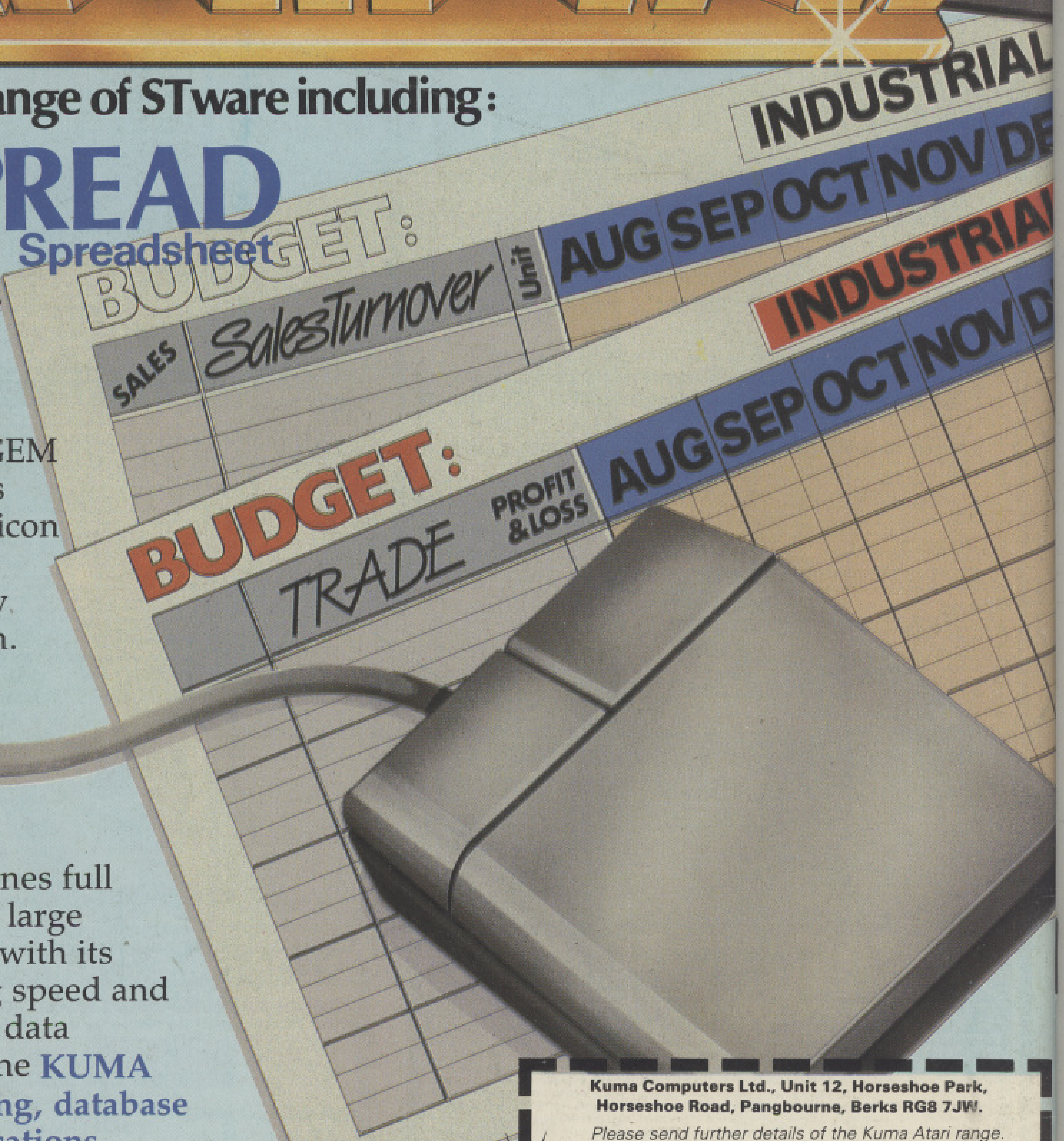
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